

# “Gastroview”: Redesigning the Food Ordering and Reviewing Experience (Group 14)



**Abstract:** The current state of traditional food ordering and reviewing is time consuming for the customer, resource-draining for the restaurant, and there is great difficulty finding reliable reviews for a restaurant before paying a visit. Gastroview is a mobile application which solves these key issues. In this document, the team sets out to redesign the food ordering and reviewing experience.

- Software and its engineering → Software creation and management
- Human-centered computing → Human computer interaction (HCI)
- Ubiquitous and mobile computing

Additional Key Words and Phrases: Food ordering, user reviews, user experience

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## 1. PROBLEM DEFINITION

Ordering food at restaurants typically requires the waiter to serve customers and take orders, usually via pen and paper. This process can be erroneous and time consuming. Also, when choosing a place to eat, it can be helpful to attain an idea of what previous customers thought of their experience. The group has decided to prototype a product which aims to solve problems associated with both of these user experiences, allowing restaurants to collect and respond to customer feedback via the same app as customers can order from. By channeling the ordering and reviewing processes into one application, we hope to shorten queues, reduce mistakes in ordering, and create a means for quick, bidirectional and reliable feedback between food outlets and their customers.

### 1.1 Problem Motivation

Our main reason for choosing this project is the clear lack of current systems that allow customers to order food in advance, and leave feedback for the café/restaurant at the same time. By making use of a remote, computerised ordering process, food outlets will benefit from a reduction in queues and will allow for more accurate estimates of waiting times to customers, improving overall customer satisfaction. The system will not replace the traditional waiting service completely, but giving patrons the option to use such a system if they are short on time or know specifically what they want to order in advance would be beneficial.

Although existing systems address the experience of food ordering to an extent, they mainly focus on takeaway food and seemingly offer establishments few incentives to warrant implementing the system. Restaurant/café review services are common, but user feedback can be unverified, biased or dishonest (a user may not have dined at the premises), leading to negative reputations of businesses which are not always representative. We think that it would be appealing to both customers and restaurants alike to be able to read verified, constructive feedback. The proposed system addresses this issue by placing a main emphasis on user feedback, only allowing reviews submitted after food or drink has been ordered and paid for. This will hopefully improve the confidence businesses have in the validity of their reviews. Reviews could be incentivised in exchange for customer discounts or loyalty scheme. We believe this is the main motivation for restaurants and cafés to use the new system instead of existing alternatives, and a key design change from the existing user experience. These potential benefits are what motivated us to continue developing the idea behind this project.

### 1.2 Target Audience and Intended Users

Since the objective is to redesign the ordering and reviewing of food experience, it would be useful to identify the key user groups who will use our system. There is a potentially large target audience, as the idea of ordering food in advance may appeal to anyone in a rush and in search of somewhere pleasant to eat. Key user groups include customers ordering and reviewing the food, the restaurant employees responsible for processing orders, employees preparing the orders, employees responsible for processing payments/reviews, and the restaurant management. Especially in the cases of restaurant employees, users may be part of more than one of these groups. Already, it is clear the system will appeal less to users with less technological experience, but performing research will likely help us to more fully define the set of user groups that require consideration.

### 1.3 High Level Features

We then began to consider some of the key features our system will include in order to be successful in addressing the problem definition. These are summarised below:

Table I. High Level Features

FEATURE	DESCRIPTION
<b>Food ordering system</b>	Allows people to order and pay for food prior to arriving at the restaurant reducing the initial wait time for the customer's food. Payments could be handled using PayPal, but there is scope to expand to other systems such as Stripe.
<b>Reviews based system</b>	Users can submit reviews through the app for restaurants they have purchased food from. This system could be bidirectional, so restaurants can respond to feedback.
<b>Loyalty schemes</b>	Allows restaurants to give discounts or codes to people who provide constructive feedback.
<b>Back end system for restaurants</b>	A separate interface for restaurants using the app, allowing them to manage discounts, keep track of orders and view customer feedback.
<b>Restaurant list</b>	A list of restaurants that can be sorted by rating, review, distance, capacity or free tables.

Now we have defined a problem area and the motivation for a solution, as well as some high level features such a system could include, we will research into existing solutions to analyse the best and worst features of each. We will also ascertain the academic research that has been carried out on areas such as user experience.

## 2. RELATED WORK: LITERATURE REVIEW & EXISTING SYSTEMS

*This section explores existing literature and systems carried out within the field of restaurant food ordering and reviewing, allowing us to analyse the features that were and were not successful in the target domain. We will use the findings of our research to hone our requirements elicitation, enabling us to get the best use out of user interaction in our upcoming surveys and interviews.*

A number of mobile/PDA based applications have been designed (Figure 1.1), implemented and developed for commercial use in a restaurant environment. In an article which explores the need for high-efficiency automation in the hospitality sector, S. Tanpure et al. identify key areas in which automated food ordering systems offer benefits over conventional food ordering systems (K et al., 2009). It has been found that conventional methods relying on indirect communication between the customer and the kitchen staff via a waiter were the main sources of error during the ordering process. Human error introduced at this stage causes issues such as the kitchen staff cooking the wrong food, which wastes time, as well as wasting money due to unwanted food being disposed. Introducing a system to allow the customer to directly communicate their order to the kitchen staff is, therefore, an obvious change that can be made to reduce human error - simply put, removing the waiter from the process removes any chance of them making mistakes. This direct communication is also more efficient than waiter-based communication. It was shown that even though the time it takes for a waiter to take an order from the customer and deliver it to the kitchen may only be a few person-minutes per order, in a business situation the volume of orders soon sees this time wastage accumulate. By allowing instantaneous, unambiguous communication between the customer and the kitchen, the time savings may be significant (Tanpure et al., 2013).

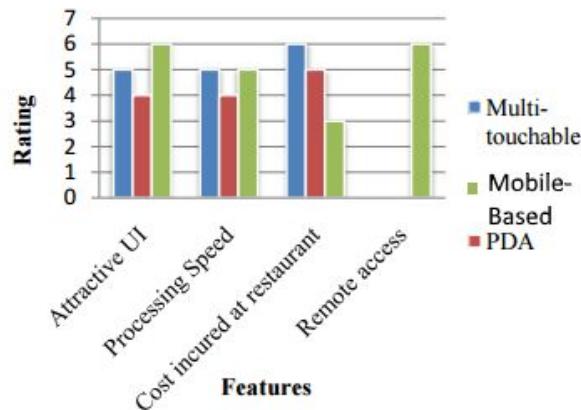


Figure 1.1 - PDA interface for the system waiters used in research (K et al., 2009)

Paul and Paul claim that printed menus fail to provide a user with sufficient information to make an informed decision on what meal to order. It also goes on to say that user experience was reported to be better for a custom electronic menu accessed through a tablet computer. The article further explains the improvements an electronic menu provides, specifically for people with dietary restrictions, medical or otherwise, as it would be capable of displaying only the dishes that meet their criteria. It continues outlining other barriers people might meet whilst using a paper menu such as language, lack of illustration and no explanation of which dishes complement each other. The general direction the article takes is the lack of information a paper menu can provide and that an electronic menu would provide over its paper based counterpart. This is significant for us as it makes a clear case for ordering using an electronic menu which further reinforces benefits that our application would provide (Paul, Paul, 2013).

With regards to the implementations, web-based applications are preferred due to their

cross-platform accessibility (Duncan et al., 2000). Both PDAs and large multi-touch displays have been trialled with varying degrees of success, but each presents its own challenges. Both require considerable monetary investment – purchasing enough multi-touch displays or PDAs to fulfil customer demand at peak times may be impractical for many businesses, and both present difficulties regarding displaying complex user interfaces and performing maintenance. A mobile-based system was found to be superior in all cases, since it shifted the need to invest in hardware away from the business and can be easily maintained and updated (Tanpure et al., 2013) (Figure 1.2). Unlike desktop PCs and laptops, mobile devices have many constraints such as screen display size, interaction techniques and bandwidth over mobile networks (Dejin et al., 2006). It is also worth noting that mobile phone-based allow the potential for remote-ordering to be integrated into the system (Tanpure et al., 2013). It is important to focus on a user friendly GUI for both client and server to make the application more appealing. It is suggested that Bluetooth technology may make the application more simplistic and robust, however for large data transfers over long distances it is not a feasible option. (K. et al., 2009).



*Figure 1.2 - Ratings Given by Restaurant Staff to Various Devices Used to Collect Orders from Customers.*

(Tanpure et al., 2013)

The literature by Scifo et al. is a patent application which describes an online food ordering system that restaurants can register for, it allows different restaurants' menus to appear online so customers have access to a variety of restaurants to order from in one place. This system unlike others takes a one-time fee rather than charging a regular fee or a percentage on each order. Figure 1.3 illustrates how the system works (Scifo et al., 2009).

The restaurant pays a fixed registration fee for the service, a merchant account is then created for the restaurant which includes a unique account key with all the necessary information associated with it. The system works using three different servers to go about confirming orders. The first server receives orders from customers and has data storage device including unique account keys, menu items and other information about the restaurants. The second server communicates with the first server so it can process credit card payments from customer and transfers the payment to the right restaurant. The third server communicates with both the first and second server so it is able to receive the order from the first server and transmit it to the restaurant (Scifo et al., 2009).

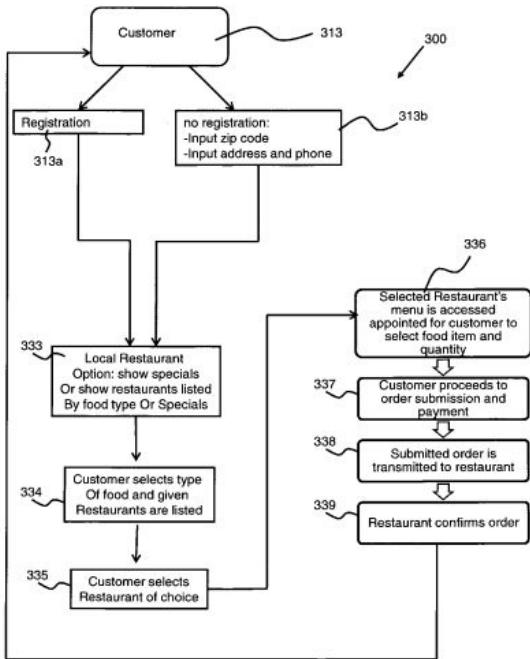


Figure 1.3 - High Level Design of Online Food Ordering System (Scifo et al, 2009)

## 2.1 Reliability of Review-based Systems

The value of reviews in today's technological climate could be considered more important than ever, with user's travel and dining plans largely influenced by the opinions and experiences shared by others online. TripAdvisor is one of the most prominent services of this kind. Chua et al. (2013) suggest through their research that inter-reviewer reliability is mostly strong on TripAdvisor: there was no significant variance in ratings for a group of hotels that were evaluated by a common pool of reviewers. Intra-reviewer reliability was also relatively high, referring to the potential difference between a user's quantitative rating and their qualitative comments. Although this study refers to hotels in particular, the same principles could apply to restaurant reviews on the site.

However, Chua et al. suggest issues still exist in terms of biased and misleading reviews. Unlike systems such as Expedia, users are able to submit a review for a business without any proof that they completed any transactions. The motivation of users to submit reviews must also be considered. Some users may post reviews to primarily benefit others, while others may only be motivated to post a review if they have had a particularly good or bad experience. There are also recorded instances of workers at some restaurants and hotels offering incentives to customers in exchange for positive TripAdvisor reviews (Fernandez, 2011), which leads to a clear reduction in reliability. Both of our main user groups would benefit greatly from improved review reliability, since it would give restaurants more accurate feedback from which they can improve, and would give customers a more accurate representation of what to expect from a venue.

Although the methodology of this study is relatively thorough, one of the highlighted weaknesses is the data set used within the research. The reviews used are taken only from a sample between the years 2004 and 2010, therefore potentially failing to consider the temporal factors that may affect the results of the study. For example, the influence social media has had on the tourism and dining industry is something which has been mostly prominent after this time period, so it is possible more recent reviews could have lower reliability.

## 2.2 User Research

Alagoz and Hekimoglu investigate the factors that influence the attitude of internet users towards online food ordering. The study was conducted among Turkish university students, both graduates and undergraduates. Questionnaires were used in order to collect data from a large number of students, with people aged 21 to 23 being in the majority of those that were returned. The data from the questionnaires allowed the researchers to assign general scores to many variables related to online food ordering, including attitude, perceived ease of use, perceived usefulness and trust towards the system. Analysing the results showed that most items had scores that would be considered "Perfect" according to Moore and Benbasat's commonly accepted values for these allocated scores that were set in 1991. The conclusion to the report was that people's attitudes in general towards online food ordering is very positive, as long as the system is easy to use, trustworthy, and genuinely useful. Through the development of our proposed system, the team will aim to fulfil these qualities in order to receive a good attitude from users (Alagoz et al. 2012).

### 2.3 Existing Systems Comparison

FEATURES	SYSTEM NAME					
	Grubhub	MenuDrive	Ordo	ChowNow	iMenuPro	TripAdvisor
Type	Food Ordering	Food Ordering	Food Ordering	Food Ordering	Menu Creation	Review Based
Mobile Integration	✓	✓	✓	✓	✗	✓
Web Integration	✓	✓	✗	✓	✓	✓
Discount System	✗	✗	✓	✗	✗	✗
Menu Creation	✓	✓	✓	✓	✓	✗
Review System	✗	✗	✗	✗	✗	✓
Delivery (System delivers for restaurant)	✓	✗	✗	✗	✗	✗
Delivery Support (Tools provided for restaurant to deliver)	✓	✓	✗	✓	✗	✗

See Appendix A for full analysis and research on each of the existing systems.

### 2.4 Summary of Literary Review

The issues found in contemporary feedback and review systems regarding unreliable reviews could be resolved by requiring users to make a purchase at the restaurant before reviewing. This adds an aspect of verification to the reviews. Our research also strongly suggests that a mobile-based implementation would be more favourable than a PDA or multi-touch display based system, due to issues of convenience for the customer and low hardware costs for restaurants. When designing the requirements for our new system, we considered it important to consider these issues, as well as the issues encountered by existing systems.

### 3. REQUIREMENTS

*At this stage, we continue to consider potential stakeholders within our system and how their needs can be satisfied by our system. Requirements were formed from information gathered from our users and a variety of other sources. Specific implementation details and user interface designs will be considered in a later section.*

#### 3.1 Literature Review and Existing Systems Research

Engaging with research carried out on academic articles and existing systems enabled us to draw useful conclusions about features that we would need to implement in our own system, as well as identifying flaws in existing systems that ours could improve on. The presence of an account system in our application means we also need to consider the ethical and legal implications of storing personal data. This is something reflected in Appendix G, Requirement 4.4, stating that our system must comply with the 8 principles of the *Data Protection Act* (1998).

Our application is also heavily based around the concept of users sharing reviews of their experiences, forming a key component of our Functional Requirements. Appendix F, Requirement 3.5 defines how the review system will operate. We chose to use a review model which includes a star rating, textual feedback and the reviewer's username. This is similar to how systems such as TripAdvisor [Appendix A] present reviews, but our system differentiates itself from existing ones in the sense that reviews can only be submitted *after* a purchase has been made in order to ensure the validity of reviews [Appendix A, Section 2.3]. These are just a few examples of how reviewing literature and existing systems assisted us in beginning to concretely define our system. We supplemented these ideas with the opinions of stakeholders in order to consider features which users desire, but aren't present in existing systems.

#### 3.2 Survey

In order to better understand the views of our system's potential stakeholders, we carried out a short survey to verify whether our assumptions about the customer user groups' needs were valid (as shown in Appendix B), and to try and identify any user needs which we had not previously anticipated. The main goals of the questionnaire were to discover how many of our potential users already own a smartphone and if so, how many of them have used their smartphone to order food in a restaurant context. We also wanted to find out whether the review aspect of our system would be useful to our target users. Further details on our methodology and analysis of results can be found in Appendix J.

The survey indicated that the majority of users (97.9% of respondents) [Appendix C] own a smartphone, and that over a third of respondents had used a smartphone-based service to order food before. This is suitable evidence to validate our system design plans to create a smartphone-based app for customers to order food, since such a large proportion of our sample already owns a smartphone, and may have already used a similar service. From this it can be deduced that users would require our system to offer support for smartphones, since the problem domain clearly lends itself so well to this platform. Another insight from our survey is that users would be interested in ordering their food in advance, before they arrive at a restaurant - it would be required that our system should support this type of food ordering. With the majority of our respondents stating that they would be willing to download an app for this purpose [Appendix B, Figure 3.4], we are confident there is demand in the market for a system of this kind, and it also suggests that using popular app-stores as a distribution platform for the app could be viable.

The apparent enthusiasm of the survey respondents to use and provide feedback through the use of restaurant reviews suggests that our plans to include reviewing features are justified. Because of this, our system should support the submission of reviews for restaurants, the viewing of previously submitted reviews, and searching/navigating these reviews based on metrics such as star count etc. Using this in conjunction with our existing system research into TripAdvisor's flaws [Appendix A] and our interview, we can see that reviews should only be accepted after a verified payment has been

made [Appendix C, Q5].

### 3.3 Interview

Having gauged the needs and desires of our customer user group by means of a survey, we needed to engage our restaurant end user groups in order to find out what they would need from our system. We chose to conduct an interview with a former member of the service team at a McDonald's restaurant and current supervisor at a J.D. Wetherspoon restaurant, the full details of which can be found in Appendix C. This interview revealed a number of interesting insights regarding our users' needs, and about the problem environment. Backing up prior research into the problem domain, the interview confirmed that the majority of problems with conventional waiter-based food ordering systems occurred during the process of taking an order from the customer, processing it, and taking it to the kitchen staff (Appendix C - Q3, Q4). As was found in our original research, human error introduced during these steps the customer's and the staff's time, while wasting the money of the restaurant on preparing unwanted meals. It was also confirmed that great time savings could be made by cutting out the human element in this process, allowing messages to be directly sent from the customer to the kitchen staff. It was agreed that allowing customers to use their own mobile phones to place orders would help alleviate these issues, cutting the waiter out of the process, as long as the customer could access the full set menu and specify any bespoke changes they would like made to their order (Appendix C - Q7). Concerns were raised about the ethics of automating this part of the process, since it would make the role of the waiters somewhat redundant - this will need to be carefully considered when implementing the system in order to keep the role of the waiters relevant, and reducing redundancies where possible (Appendix C - Q7).

The interview also provided us with insights as to how to architecturally structure our system is. It is suggested that the system will require three interfaces - an interface between the customers and the system to find restaurants, submit orders and view the progress of orders, as well as managing reviews; an interface between the waiting/management staff and the system to check on the progress of orders, change the state of orders, and complete administrative tasks such as editing the menu; and a third interface between the kitchen staff and the system, which can be used to view and change the state of orders (Appendix C - Q1, Q2, Q4). This description lends itself very easily to a client-server type implementation. The interview also introduced the concept of a 'state' for an order, which can be set/read by various users in order to set the non-automated parts of the system (e.g. waiters delivering orders to the customer from the kitchen) into action (Appendix C - Q2, Q3, Q4). The interview also reiterated the fact that existing review services make it far too easy to post an 'fake' or exaggerated review, and that adding some way to verify reviews into the system would set it apart from those which already exist (Appendix C - Q6). Incentives are also confirmed to increase the amount of feedback received, meaning that integrating some form of incentive rewarding into the system would be a high priority.

### 3.4 Personas

After analysing the results of our previous requirement gathering activities, we identified some potential shortcomings in our work with regards to learning from our full user group, such as having little input from users over the age of 65, and little data related to users who would need extra accessibility support from the system. To supplement our actual findings, we constructed personas in order to help us consider imperfect users, and how our system would need to support them [Appendix D]. Further description of our persona generation can be found in Appendix K.

Using our personas, we reconsidered the requirements generated from our previous requirements gathering activities (i.e. regarding 'ideal' users), but consideration of our new imperfect users allowed us to generate requirements such as implementing a high-contrast display to assist partially sighted users, and implementing clearly labelled controls to assist inexperienced or non-tech-savvy users such as the elderly. It also made us consider using some sort of interaction metaphor, such as classic tickets for the restaurant system described in our interview [Appendix C], in order to make it clearer to users how to operate the software by giving them hints and allowing them to relate its usage to

real world scenarios.

### 3.5 High Level Task Analysis Diagram

In order to fully understand the needs of users, and break down these needs into required system functions/components, a high level task analysis diagram was constructed (Appendix H). Constructing this diagram was straightforward, but extremely beneficial as it structures the tasks by the order in which a user is likely to perform them, and shows exactly what functionality should be considered in the system. It also allowed the team to collaboratively think of tasks that users would want to perform on the system, and show the ideas as one structured diagram. From analysing the diagram, the team was able to write detailed functional requirements that are relevant to the users' needs. Most of the functional requirements in Functional Requirements table 1 (Appendix F) arose from analysing the task analysis diagram, with some arising from the interviews and/or survey results.

### 3.6 Use Case Diagram

Having considered the needs of the users from our system by breaking down the actions they will want to perform (see High Level Task Analysis), we can form use cases to describe some of the high level functionality that users have indicated that they will need from our system (Appendix I). As the system will consist of two user applications (Customer and Staff Member), two use case diagrams were constructed, to properly analyse exactly what functionality each application will need. These diagrams were referred to often whilst creating the list of functional requirements for both the customer application and the restaurant application (Appendix F), as visualising how users would use the system made it significantly easier to construct requirements that are relevant and not excessive.

### 3.7 Requirements Elicitation

From our requirements elicitation activities, we can see that there is a core set of high level features that must be delivered by the system in order to fulfil even the most basic of our user groups' needs. The system should offer a mobile interface through which users can place orders and, after having paid for their order, through which they can submit a review for the restaurants they have ordered from. Additionally, a set of three interfaces should be offered to the restaurant end users - one so-called 'kitchen' interface which can be used to view and update the state of orders, and some other 'management' interface which can be used to view and update the state of orders, as well as verify payments and update restaurant information. Additionally, there should be a central system which should store and maintain the list of restaurants, orders etc. and through which the other parts of the system should fetch their data.

### 3.8 Conflicts in Requirements

There are two main types of conflict that are encountered in project management - conflicting interpretations and conflicting designs. Frequent checking back to the requirements definition minimises the chance of an inadequate final product. Frequent meetings to discuss the progress of the project gave the team a common goal and making meetings regular ensures that members are frequently reminded of the overall aims of the project, making misinterpretations less likely, and hence proposed design ideas conflicting less likely.

An example of this is in the restaurant end of the application. Originally, the aim was to produce a single restaurant view which the waiters, kitchen and managers would all access. From the interview conducted with a restaurant worker who had both waiter and managerial experience, it became clear that each group would need access to a different set of information - the requirements generated in each case conflicted, and so were resolved by breaking the application up to have three different views.

**A complete and highly detailed table of functional requirements can be found in Appendix F, with a similar table for non-functional requirements being located in Appendix G.**

### 3.9 Focusing Requirements

In the next section we will focus on designing the user end of our application. This means taking the

list of requirements generated in this section, after having researched the needs and desires of our users, and aiming to design and prototype the restaurant-end order processing and customer-end ordering and reviewing parts of our system.

The low and high fidelity prototypes we produce in the design section will be an articulation of the requirements table. Low fidelity prototypes will be generated in initial iterations and higher fidelity prototypes generated based on the feedback gained from lower ones. Clearly, new requirements will be generated during our engagement with users during the design phase, this feedback will be used to generate new requirements and adapt existing ones, so that the feedback can be integrated into future generations of prototype and, eventually, the final system - appendices F & G will be updated with these new and adapted requirements as they are discovered. In this way we can follow the HCI design, prototype and evaluation cycle. A short summary of this activity can be found below in section 3.10.

### 3.10 Requirements Gained from Design Phase

During our design phase prototyping activities, our constant interaction with users to gather feedback on our designs justified our existing requirements, which when implemented garnered positive feedback, but it also allowed us to discover flaws and shortcomings in our original requirements. Sections 4.1, 4.2 and 4.3 all detail our prototyping process, showing how we have gathered new requirements and adapted old ones, such as when a table management utility was suggested during the second iteration of the restaurant-end medium fidelity prototyping stage, the requirements tables was updated with new related requirements [Appendix F, Table 2, Requirements Subsection 2.5], with the necessary changes being integrated into the third generation medium fidelity prototype [Appendix R, Figure Set 3], which would then be presented to users once again for further feedback. This process was typical of our requirements gathering activities during the design phase, and allowed us to improve the quality of our requirement and more full meet our users' needs.

## 4. DESIGN MODEL AND DESCRIPTION

*This section is an articulation of our requirements section. We designed a range of low to high-fidelity prototypes and based each design on user feedback from the previous. Below is a description of the prototypes with comments on how each design was received and design changes made in response.*

### 4.1 Storyboard Design

We designed storyboards [Appendix L & O] for customer and restaurant applications which derived from the task analysis diagram [Appendix H], illustrating how each user would use the system. Storyboards assisted in designing prototypes, helping us realise how to make system design and navigation easier for the user, while omitting some intricate details. Feedback showed that the customer interface was easy to use because it felt similar to other systems thus should be easy for users to pick up and use. Users frequently asked whether the system allows tracking an order's progress - this is not shown in the storyboard but is a requirement [Appendix F, Req 1.5.6] and is included in high-fidelity designs. The customer-side storyboard represented most of the relevant requirements, showing users how to interact with the system. Amongst feedback for the restaurant-side storyboard, users felt another form of authorisation should be required when editing orders. As a result, only certain members are now allowed to access certain higher-level features. Requirements currently only state a restaurant login is required, but a staff/admin login would provide greater security.

### 4.2 Low-Fidelity Prototypes

Feedback gained from demonstrating storyboard designs was utilised when creating low-fidelity prototypes. The initial design of our system was expressed in a way which is unlike the final medium, namely paper and card sketches [see Appendix M & Q]. These were used to develop many ideas in a quick and easy way, enabling us to redesign the application rapidly after collecting user feedback.

- a) **Sketches [Appendix M & Q]:** These demonstrated screen layouts and information display. Accompanying post-its and written descriptions aided the users in understanding our design.
- b) **Cardboard cutouts [Appendix M & Q]:** We created cardboard cutouts of the designs displayed in Appendix M and Q to show users the proposed task sequences. Each card represented one screen.

During field testing, users told us that they wanted ratings displayed next to every restaurant in the browser by default, instead of as a choice in the filtering stage. Also, the ability to filter by restaurant category and cuisine was requested. For example, having 'fine dining' and 'fast food' as categories instead of simply 'Chinese', 'Indian' and so on. Users also desired a map feature that would display how far away the restaurant was from their current location. It was generally deemed useful to add an "estimated time remaining" on orders so that users could plan in advance how early to arrive at the restaurant. Finally, it was also noted that users wanted to see how they could apply saved discounts to a new order. Sketches and cardboard cutouts were used *in parallel* to demonstrate concepts to users. We then chose to create medium-fidelity prototypes which would allow us to consider system usability in greater clarity to compensate for the inherent flaws of low fidelity prototyping - observing how a user naturally responds to the interface and their preferred interaction modes.

### 4.3 Medium Fidelity Prototypes

Medium fidelity prototypes for restaurant and customer-facing systems were built on feedback from low fidelity sketches, in order to create an interface that better matched expectations of users. Element-linked slideshow-based prototypes were created, each iteration improving on the previous by incorporating user feedback. Users navigated around screens as in the final product, without being able to edit fields or access high level functionality. This was a flaw in prototyping media, but allowed clear, navigable prototypes which were quickly changed after frequent feedback.

## Customer End

Users wanted restaurant ratings displayed next to every restaurant in the browser, since rating is an important factor in choice of restaurant, so this was added along with options to filter by type of restaurant and cuisine. On the restaurant information page, a map button has been added, which takes the user to a map showing the location of the restaurant in relation to the user. On the order confirmation page, a message now shows the estimated time remaining for their order to be ready, which gives users an idea of when they should arrive. Finally, from low fidelity prototypes users wanted to know how to apply discounts to orders. There is now a dedicated page for applying a discount to an order, shown to users prior to paying. Users indicated they would feel more comfortable using an interface that resembled a phone screen, instead of the given interface, which wasn't designed with phone screen dimensions in mind. In the second iteration, each slide is formatted on a phone template to make users feel closer to using a mobile application. Showing this second iteration to users allowed more feedback on improvements. The interface was deemed not very aesthetically pleasing, as the design was plain. Users also felt that they would like to bookmark restaurants they are interested in, so the application feels more personal. In feedback on the interface, users felt the final application would benefit from a bar at the bottom of the interface with navigation buttons, instead of navigating to the home page each time a screen in a different part of the application was needed. This is a feature of many modern mobile applications, and is something to be considered in the high fidelity prototype.

## Restaurant End

Our initial slideshow prototype was essentially a navigationally functional version of our low fidelity prototype. When field testing it, a number of issues were raised in regards to features that our restaurant-end users desired, but that were not present [Appendix R, Figure 1]. These issues pertained to the options offered when creating discounts, and about the amount of information shown about each order - the users said that they would like to offer both 'flat price' and 'percentage' discounts, identified that additional menu item identifiers called 'types' would be useful, as well as needing to be able to see the time each order was placed, and any custom user comment on orders. These two features were added to the second iteration [Appendix R, Figure 2], and associated requirements were added [Appendix F, Appendix G]. The feedback gathered in regards to our second generation slideshow prototype was generally positive; the ease of navigation and clear style were especially praised, and the only feature that was requested at this stage was some way to define and manage restaurant tables - in particular, being able to add/remove them, set them as occupied or unoccupied, and view the status of all tables. This feature was added to our third generation slideshow-based prototype [Appendix R, Figure 3], and appropriate requirements were generated in doing so [Appendix F, Appendix G]. This third generation was approved by our users and no new features or changes were suggested, so the decision was made to move to a final, even more functional prototype medium before starting to work using the final product medium.

### 4.4 High Fidelity Prototypes

Having received feedback for our medium and low fidelity prototypes, we created a high fidelity prototype using POP by Marvel, an app which allows UI designs/sketches to be imported and linked together using tappable areas such as buttons and text fields. This method of prototyping allows our users to get a better idea of what the final app would look like visually, whilst maintaining the amount of functionality expected from a prototype, while using the same digital, touch-based, explorable medium as the final product while still allowing us to easily iterate over designs.

**It is important to note that only a customer-side high fidelity prototype was designed.** This was because prior to this, our third generation restaurant-end medium fidelity received wholly positive feedback and no improvements were suggested. We also felt that we would be able to more effectively refine the user experience on our customer application if our focus was narrowed to only

one application. Compared to the low and medium-fidelity prototypes we have developed, high-fidelity prototyping offers several advantages which will make our user feedback gained from the process even more constructive [Appendix O]. Many of the user suggestions from testing our low and medium-fidelity prototypes were taken into account when designing this iteration of the system. For example, a full tab-based user interface was implemented, which many users felt more familiar to navigate compared to the 'hub' page used throughout the medium-fidelity iterations. There were also some slight tweaks made to the layout and features of the app to make it more user-centric and based around the concept of restaurant discovery. For example, the search functionality was made more prominent, a 'featured restaurants' section was added and users are now able to curate a list of their own 'favourite' restaurants.

Feedback from field testing was overall very positive because the prototype itself was a synthesis of all ideas from previous prototypes. Chronologically, it was the final one designed and incorporated improvements from the low and medium fidelity prototyping stages. Notable comments on the high fidelity customer prototype [Appendix O] included that the replacement of buttons with text for buttons with icons provided an aesthetically pleasing interface, allowing the user to easily navigate through the application without requiring much time to read information on navigation buttons. Other comments included that users liked that the core focus of the design was on the search feature. The fact that the application was centred around the search with plenty of criteria to select and filter particular restaurants made users a lot more inclined to use our application. As seen in our medium fidelity customer end application, more concise information is now displayed on restaurant search results, with more detailed information consolidated into chunk son the restaurant's information page, allowing for easier Cognitive Walkthroughs. Finally, it was noted that users liked the personalisation incorporated into this high fidelity design. A 'Favourites', 'Past Purchases' and 'Me' tab at the bottom of the application allowed for a user to build up a longstanding reliance on our system - being the place to go for their next purchase or to utilise their incentives and discounts.

#### 4.5 Summary of Design Findings

**The changes made to requirements as a result of these prototyping activities can be found in Section 3.10 of our report.** Initially, low fidelity sketches demonstrating basic system navigation presented us with useful feedback to incorporate into medium fidelity designs. For example, ratings were displayed in an improved way and more filters were added to the search feature, as well as a map displaying the location of the desired restaurant. When testing the medium fidelity prototypes, we obtained feedback on how to improve the restaurant end by including extra information about orders and discount options [Appendix R, Figure 1]. Ease of navigation was praised, with a main comment being to include table management in the third iteration [Appendix R, Figure 3]. The second medium fidelity iteration of the customer-facing application [Appendix N, Figure set 2] improved on the first by drawing the interfaces on a phone template and adding a main tab navigation bar. The high fidelity customer end prototype [Appendix O] received high praise for its incorporation of previous designs' feedback and improved aesthetics. Switching the focus of the interface to the search feature and adding more detail in line with search results were both positive changes. Finally, a greater level of personalisation with 'Favourites' and 'Past Purchases' made users more likely to rely on the application for repeated use.

**Using the user feedback and reviewed requirements from this stage, a final prototype was designed and and a range of analytical and empirical evaluations were performed. The decision was made to narrow the focus on the customer side for the remainder of the project.** This will enable more effective customer user experiences to be designed within the project's time constraints. Medium fidelity prototypes have been designed for the restaurant end in this section, however it is the customer end that will be prototyped and evaluated in the final deliverable.

## 5. EVALUATION THROUGH USER STUDY

*After developing a functional prototype of the customer application, users could properly interact with our system in the intended manner. This section is a reflective account of evaluation activities carried out when showing expert and inexperienced users our final product.*

### 5.1 Choices of Users and Evaluation Technique

To evaluate the system thoroughly, customers were split into “expert” users (experienced with applications of a similar nature) and “inexperienced” users (minimal experience using ordering and reviewing applications). The inexperienced group allowed us to determine how intuitive the application is, whereas the expert group allowed us to test functionality relative to similar systems.

### 5.2 Minimising Threats to Validity

For each potential threat to validity, strategies were implemented to minimise them. The first threat is a ‘training effect’, where a user would become better at using the app the more tasks they complete. This was minimised by ensuring similar tasks were performed by different users. To avoid self-selection bias, we asked specific types of people to assist in evaluation rather than for volunteers, providing us with a population that is statistically similar to that of the potential user base. To avoid social desirability bias we gave all participants written instructions and minimised interaction throughout, preventing users seeking assistance from peers or those conducting the evaluation. Resultantly, comments made simply to please the evaluators were minimised. To avoid fatigue affecting results, we didn’t give each user more than a few tests to complete. To avoid order bias, we gave users tasks in different orders, preventing a single task always receiving the most effort due to being the first completed.

### 5.3 Description of Final System

The final prototype [Appendix X, Figure 1] was developed in Java Swing and MySQL. The team was familiar using these platforms from previous projects, allowing more time spent producing useful work than learning new technologies. There are disadvantages - for example, Java Swing is mainly designed desktop applications, rather than mobile applications. This means we were not able to include all functionality that could have been implemented on a mobile platform, such as swiping gestures. That said, when demonstrating to users, we were able to run the application on a tablet PC, which allowed us to mimic a mobile environment. The application was designed with screen dimensions of a normal smartphone to further simulate the experience. This trade off allowed us to make the system more functional and interactive during evaluation stages.

### 5.4 Analytical Evaluation

This stage involved approaching **expert users** for feedback on how the application compares with existing applications according to those who use this type of system often. One advantage of this type of evaluation is that it allows us to see how easy the system is to navigate and learn with minimal documentation (Tonkin, 2005). A **Cognitive Walkthrough (CW)** was carried out with the same Restaurant Supervisor from the structured interview [Appendix C]. Full results of the CW can be found in Appendix S, Activity 1-7.

#### 5.4.1 Cognitive Walkthrough with an Expert User

With the help of the restaurant employee who had previously helped us during our requirements gathering activities [Appendix C] as a test user, we set a series of cognitive walkthrough exercises to ensure that our application was cohesive and fulfilled the standard usability criteria. We anticipated that the employee would be able to complete the tasks with minimal false steps, though some errors were anticipated. Registering a new account [Appendix S, Activity 1] was a task accomplished with ease, with the action needed at each stage easily identifiable due to clear labelling of UI controls. Logging in with the account just created [Appendix S, Activity 2], the user navigated to the correct screen and filled out the form with necessary details before logging in. The user associated the layout with the one they had used in Activity 1, and hence was able to transfer knowledge to complete it

more efficiently, suggesting our interface is easily learnable due to recurring simple UI design patterns (e.g. lazy registration).

The user was now walked through the food ordering component of our application, exploring the usability of the search feature. The user searched for a specific restaurant by name, then found out its ‘Star Rating’ [Appendix S, Activity 3]. The search bar and options were easily accessible due to use of the search bar design pattern, and the expected search returned a single result from which they identified the star rating information. Information presented on the search result, whilst concise, is readable and understandable. Testing the food ordering feature, the user now navigated to a named restaurant’s information page, then placed a given order at that restaurant [Appendix S, Activity 4]. The search phase was completed quickly since the user had learned from the previous activity, despite having only used it once which was positive; the search feature is a central part of the application. An issue was encountered when navigating from restaurant results to the information screen, since the listing itself wasn’t seen as being clickable by the user. This anti-pattern will be removed in future revisions by text on result listings to follow a conventional hyperlinked format. On the information screen, it was suggested the ‘See Menu’ button be changed to ‘Order Now’ to make its function verbose. Ordering was completed swiftly, with controls easily identifiable, but the user identified an issue with the size options in the ordering system [Appendix S, Activity 4, Notes].

The user then browsed for a particular restaurant’s reviews [Appendix S, Activity 5]. As the user experienced searching for a specific restaurant in Activity 3 and 4, no issues arose here, however upon being presented with a list of search results, the user expected there to be a “See Reviews” option below each result. In future versions we would consider this as a shortcut. Notably, they appreciated the star rating model and could transfer knowledge from existing systems, making it obvious how to interpret reviews without necessarily reading all of the review’s message body. Next the user left a review for a restaurant after their order confirmation [Appendix S, Activity 6]. Again, due to experiences with existing applications, actions were evident at each stage. However there was difficulty identifying how to select a rating and what each star corresponded to (does 3 stars mean ‘average’ or something else?). An improvement could be the adoption of tutorial pop-up dialogues to explain how to submit a review the first time the screen is encountered - with the option to hide the dialogue permanently or until next time. This would avoid users being patronised by help even when they are used to the system. Finally, the user used the browser to locate all Italian restaurants within 10 km rated 4 stars or higher [Appendix S, Activity 7]. The user demonstrated they had learned the main navigation actions of the restaurant browser from previous tasks [Appendix S, Activity 3, 4, 5]. In order to work out how the slider affects the distance value, and how to choose a star rating (i.e. drag, swipe or click), a tutorial dialogue box would have been appreciated. Overall, the Cognitive Walkthrough showed that the user quickly learnt from previous actions and in general, correctly interpreted the feedback given to them via the application.

## 5.5 Empirical Evaluation

This stage involved **users without expert knowledge** of these applications, but whose custom is the main demographic of the finished application. A **‘Think Aloud’ evaluation** observed and measured users’ actions without breaking tasks down as in the CW [Section 5.3.1]. A **Wilcoxon Signed Rank test** analysed the nonparametric Likert Scale data about users ratings of the application in contrast with existing systems. Finally, **persona based evaluations** were devised to evaluate the system from the perspective of the personas created in Appendix D.

### 5.5.1 Task Based Qualitative Study: ‘Think Aloud Protocol’

For the purposes of this study, the ‘Think Aloud Protocol’ was used. We chose this technique not only as a means of discovering how easy our system is to learn for inexperienced users with minimal assistance, but also to gain an insight into the user’s thoughts and feelings. We expected that inexperienced users may struggle with the tasks initially and experience some frustration, but would

eventually become more confident as they familiarised themselves with the new system. The methodology is outlined in detail in Appendix T, as well as a detailed overview of the tasks performed.

A transcript from our 'Think Aloud' evaluation can be found in Appendix U, and provides insights into the user's thoughts and feelings while navigating the app. For example, the user spoke enthusiastically about the ease of creating an account and viewing discounts - these are areas which may have been well refined during earlier feedback stages. However, this user (amongst another 3 out of 10 users) did express emotions of frustration and confusion when navigating the 'Discover' screen [Appendix U, Task 3]. As a result, despite several iterations, this may be one area of the app that requires further refinement in a future update. This serves to highlight the fact that the design process should be iterative and constantly ongoing when seeking to provide the optimal experience for the end user. Furthermore, one of the key insights this method provides is the user's learning process when using the app. For example, many of the tasks in our study involve utilising the search feature. Some users struggle with this initially, but once they used it on several occasions, they became familiar with its usage. As a result, it is important not to immediately discredit an element of the interface if a user is struggling with it initially - it may be the case that there is simply no abstraction which could further simplify that particular action. While this method of evaluation does have its merits, it is also important to realise its limitations - not all verbal feedback provided by users can, or should, be taken into account. For example, one user stated that photos of each dish on a restaurant's menu is a feature they'd like to see. While this would be an appealing feature to have, from a technical standpoint it would be very difficult to implement. It would require restaurant owners to submit photos for every single dish, a task which many may be reluctant to carry out, causing inconsistencies in the system's user experience.

### 5.5.2 Task Based Quantitative Study

In addition to qualitative evaluation, we used the same tasks from Appendix U and measured the amount of time taken by users to complete each task. Initially, these measurements were intended to be compared to the time taken to complete each task by an expert user. However, from a User Interaction point of view, we found that usage statistics such as time taken or the number of clicks required are somewhat useful, but tell the designer little about where the actual interaction issues lie within the application. We also realised that the time taken to complete tasks would also be heavily biased against inexperienced users due to the fact that they were 'thinking aloud' while completing the tasks, whereas experts were not. As a result, less emphasis was placed on these measurements. Instead, the focus was placed on rich, qualitative data which are more readily translated into potential improvements on the system.

### 5.5.3 Non-Parametric Wilcoxon Signed Rank Comparison With Existing Systems

To gauge opinions on the final design, a group of users tested the prototype and gave feedback in the form of a Likert Scale rating [Appendix V]. We hypothesised that users would find our system more trustworthy and easier to navigate compared to similar existing systems. From analysing results using the Wilcoxon Signed-Rank, we obtained confidence levels, p-values, which tell us the chance that our results are purely coincidental. Unfortunately, p-values calculated from the first 2 tests into the likelihood of using our app for ordering and reviewing were significantly high, with 0.48 and 0.2, meaning no confident conclusions could be drawn. However, whilst tests don't necessarily suggest users would use Gastroview instead of Ordoo or TripAdvisor, our project in fact sets out to combine both reviewing and ordering, rather than replacing the individual apps themselves. The fact that the mean values are comparable to industry leading apps implies our design pleases our target audience. One of Gastroview's main goals was to solve the issue of untrustworthy reviews submitted using apps like TripAdvisor. In our third test asking users how trustworthy they would consider reviews from our app and TripAdvisor, there was a strong trend, backed up with a significance value of 0.008, of our application being considered much more trustworthy, since only verified reviews were allowed.

#### 5.5.4 Non Task Based: Persona Evaluations

The two customer personas from Appendix D describe a young male student and an elderly woman - descriptions of how they might use the system can be found in Appendix W. In general (although it is not always the case), elderly people may struggle more using new technology, so it is important not to deter certain users by over complicating the interface. 'Betty' allowed us to consider features supporting different demographics - for example, an option for changing screen display for visually impaired people (brighter colours, bigger fonts, bigger icons). This may make the app preferable to a menu for people with eyesight problems. It is expected that younger people will have an easier time using Gastroview, so it is likely that 'Rowan' would react positively, drawing similarities to similar existing applications. This indicates that we should continue research into existing systems and incorporate mental models from applications that feel familiar.

#### 5.6 Summary of Evaluation Findings

The Cognitive Walkthrough highlighted key strengths - users drew from experience using familiar applications as hoped during sign-up, logging in and leaving a review. In terms of shortcomings, the application could benefit from small tutorials dialogues which can easily be hidden. The star rating model was popular and consistent with existing applications. The Think Aloud protocol highlighted that our previous feedback activities were sufficient in making the interface quick and easy to use for most users, but continued to highlight potential areas of improvement. For example, in the next iteration of our system following these evaluative activities, the Search feature can now accessed by tapping a 'magnifying glass' button as opposed to a text box. This followed from user feedback relating to the fact that search filters were difficult to find. Furthermore, the Wilcoxon Signed Rank test concluded that users would find Gastroview more trustworthy than an existing restaurant reviewing application due to all reviews being made by customers after an order is placed. Personas explored new demographics, considering features to make the application accessible to a greater number of users. In the next section we will demonstrate our final system in the form of a video and make conclusions on the Design-Prototype-Evaluate cycle of Gastroview and its effectiveness in redesigning the food ordering and reviewing experience.

## 6. FINAL CONCLUSIONS

In terms of what went well during the project, the review of existing systems and literature [Appendix A] synthesised a unique concept that incorporated features shown in existing systems, allowing research to yield a greater insight into what our target users thought of current implementations early in the design phase [Appendix B, C]. From the range of systems reviewed, a gap in the market was identified for applications with verified restaurant reviews. This was made the focus of Gastroview - unifying restaurant discovery, ordering in advance and the provision of trustworthy, incentivised reviews. Requirements and prototyping phases were successful because regular user feedback was made central to the design cycle. Feedback from low-fidelity prototypes was accounted for when constructing higher fidelity prototypes, in keeping with the HCI design cycle. For example, the restaurant browser was made central to the application's navigation hierarchy as a result of user feedback, making it easier to discover new places to eat. During user feedback, most research performed was focused on a similar demographic, namely students, as they were the easiest to reach. The team addressed this by using personas to gain a different perspective on our system, discussed in Section 5.5.4. The 'Discounts', 'Favourites' and 'Past Purchases' screens make the application more personal in response to user feedback, lending itself to repeated use – a user can place an order at their favourite restaurant quickly, bypassing the search stage altogether.

Of course, difficulties were faced. Initially, the team had many discussions in order to determine how to give customers an incentive to leave reviews. It was decided that customers could gain discounts by submitting a review after payment, providing an element of verification and encouraging an increasingly representative number of reviews for each restaurant. Focusing purely on the customer application was a pragmatic response to time constraints and in fitting with our original objectives. This allowed for the final prototype to be representative of the end product, and evaluated with a wide range of evaluative techniques. The final prototype was developed in Swing, due to the team's existing universal familiarity with the technology. However, being more suited to desktop applications, common mobile gestures such as swiping were unable to be implemented. This was overcome by using a tablet computer to emulate a mobile environment, allowing users to evaluate a system which was closer to the original design. During the development of the high-fidelity prototype, the team realised that not all requirements for the system had been documented. For example, the tab bar used to make navigation of the application more intuitive was an extra functional requirement which had arisen whilst programming. To overcome these issues, the team had regular meetings in which requirements were revisited. The team reacted well to the demands and time constraints of the project.

**The project was successful in achieving its initial goals.** The application does  $\neg$  redesign the food ordering and reviewing experience due to its unification of several existing concepts. Trusted reviews are key to the application - all reviews submitted are done so only after an order is placed. Currently, it appears a large majority of restaurants lack a dedicated mobile application, with very few 'non-takeaway' applications allowing users to order in advance. This gives huge scope for Gastroview, with the 'featured restaurants' feature meaning a given restaurant may attract more business due to coverage on the application. As a result, there is a clear business incentive for restaurants to allow the application to use its data. User testing and feedback has concluded that users would consider using Gastroview's features over other available popular applications when eating out and reviewing their experiences. Throughout the writing of this report and the iterative development of prototypes, the team remained well organised, and every member made a good contribution. In conclusion, Gastroview redesigns both the food ordering and reviewing experience - although one could say it redesigns the food reviewing experience to a greater extent, it could be argued that because looking at existing reviews are so central to the choice made when a customer decides on somewhere to eat, it also redesigns the ordering experience as well.

## APPENDIX A: EXISTING SYSTEMS RESEARCH

System Name	Description
<b>Grubhub</b> ( <a href="https://www.grubhub.com/">https://www.grubhub.com/</a> )	Grubhub is a food-ordering company that takes orders online and on mobile. It has a collection of restaurants so you can order food from one local to you. When you order the system will notify the restaurant of the order and the restaurant can process and deliver it how they usually would, although they'll have to pay a small percentage of the order to Grubhub. In recent years, Grubhub has started to offer delivery services for restaurants that don't have their own. Grubhub also owns various other food-ordering companies such as Seamless, MenuPages and Allmenus.
<b>MenuDrive</b> ( <a href="http://www.menudrive.com/">http://www.menudrive.com/</a> )	MenuDrive is a restaurant ordering system designed to be implemented into existing point of service (POS) systems. It includes technology for managing menus, delivery zones, loyalty schemes, payment processing, customer analytics, mobile app creation and websites (including hosting). The system uses a back-end control panel for management by the restaurant and a custom front-end for the customers. The way the advertising on their website is configured gives the impression that they find customisability and ease of use (and integration) to be major selling points for such a product. The system allows for order options such as delivery, pickup and dine-in.
<b>Ordoor</b> ( <a href="http://www.ordoo.co.uk/">http://www.ordoo.co.uk/</a> )	A platform for pre-ordering and paying for food and drinks. The system focuses more on smaller, 'to go' orders. The service is still in its infancy and is currently only available in Bristol, Bath and London. Discount coupons can be generated by the system, but not necessarily for an individual establishment. For example, it could allow the user to use their discount in all coffee shops in their area or all branches of a chain. Ordoor also features a referral scheme where users receive £3 credit on their account every time they invite a friend to the service.  Loyalty schemes will also encourage users not only to continue using the service we offer, but to make frequent return visits to the restaurants they order from. Current loyalty systems based on the use of physical stamped cards are cumbersome and easy to lose. Additionally, digital loyalty cards inconvenience users by requiring them to download several different apps for all of the establishments they visit frequently, which can become difficult to keep track of. By consolidating all of the user's loyalty cards into one single app and handling the overhead required to set up such a system, many of these current inconveniences are resolved.
<b>ChowNow</b> ( <a href="https://www.chownow.com/">https://www.chownow.com/</a> )	One such existing system which focuses on novice-friendly template UIs for restaurants to adopt is ChowNow, which takes orders through a website, Facebook page, or mobile app and builds custom iPhone and

	Android apps for merchants. However, it does cost \$99 per location per month, plus a \$499 fee for the first location. It works by notifying restaurant staff via a tablet each time an order comes through. Out of the package push notifications and automatic marketing services make it easier for the restaurant to interact with its customers.
<b>iMenuPro</b> <a href="https://imenupro.com/">(https://imenupro.com/)</a>	iMenuPro is an online menu maker that lets cafes and restaurants instantly create and print menus. Users can choose from a wide range of menu templates, and personalise them to suit their own style. If the menu needs to be edited, items can be changed very quickly, which means that restaurant save time whenever a menu update is required. Using the system is simple for businesses, as there is no software installation required. All interactions are web based, meaning that there is never a need for the client to worry about software updates. The system is not limited to catering based clients; other businesses, such as salons and spas, can be used to show what products they have on offer. In our proposed system, it would likely make users more willing to interact with and use the food ordering application, so allowing cafes and restaurants to design their own digital menu for display on the app would be beneficial.
<b>TripAdvisor</b> <a href="http://www.tripadvisor.com/">(http://www.tripadvisor.com/)</a>	TripAdvisor is a platform which allows users to search for and reviews for travel-related content including hotels, restaurants, tourist destinations etc., collectively referred to as places of interest. Users can choose to search for places of interest near them of some type, and are presented with the most relevant, highest rated results, or they can choose to review a place of interest near them. Relevancy in searches is decided by numerous factors, including recency, similarity to search terms, review rating, and proximity (TripAdvisor Insights, 2016). Users can, without even having to register an account, leave a review for a place of interest, filling out a pre-made form, which when submitted can be viewed by other users and immediately affects the standing of a place of interest. TripAdvisor has a well documented flaw, namely the high potential for reviews to be 'fake', with entities such as business competitors and internet 'trolls' submitting reviews which either inflate or deflate a place of interest's ranking without actually being constructive or true. TripAdvisor also suffers by allowing members of the public to leave reviews without any sort of vetting process - reviews from amateurs are often found to be exaggerated and may not reflect the true state of a place of interest (Cochrane, 2016).

**APPENDIX B: SURVEY AND RESULTS**

- **What is your age range?**
  - Under 16
  - 16 - 22
  - 23 - 29
  - 30 - 36
  - 37 - 43
  - 44 - 50
  - 51 - 57
  - 58 - 64
  - 65+
- **On your last visit to a restaurant, what was the rough duration of your visit?**
- **What was the purpose of your visit? (e.g. business, spending time with friends)**
- **Do you own a smartphone?**
  - Yes
  - No
- **If yes, have you ever used your smartphone to order food in advance at a restaurant/café?**
  - Yes
  - No
- **Are you aware of any restaurants that currently offer a mobile food ordering system? If so, please list them.**
- **Would you be willing to download an app for this purpose?**
  - Yes
  - No
  - Other...
- **On a scale of 1 to 5, how much are your restaurant/café choices influenced by online reviews?**
  - 1 = Not at all
  - 5 = Entirely
- **On a scale of 1 to 5, how often do you leave online feedback for the restaurants/cafés you have visited?**
  - 1 = Never
  - 5 = Every time
- **Would you be more or less likely to leave online feedback if discount incentives were offered on your next visit?**
  - More likely
  - Less likely
  - It would make no difference

What is your age range? (47 responses)

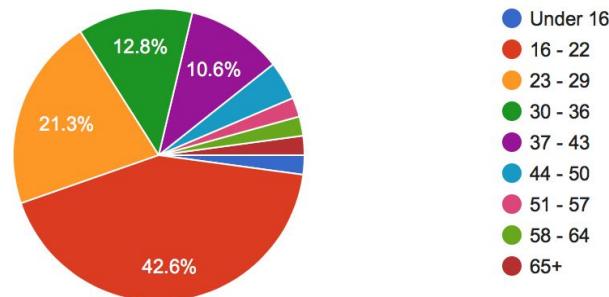


Figure 3.1

Do you own a smartphone? (47 responses)

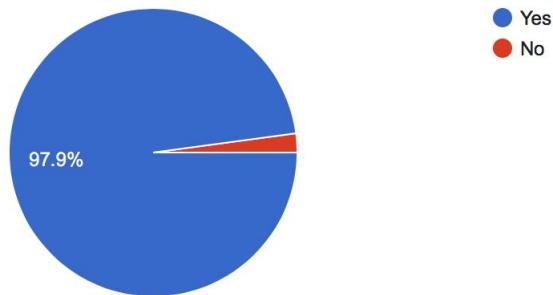


Figure 3.2

If yes, have you ever used your smartphone to order food in advance at a restaurant/caf ?

(47 responses)

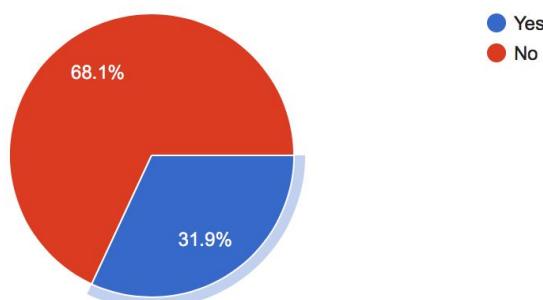
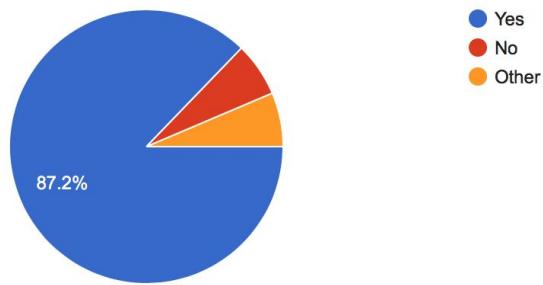


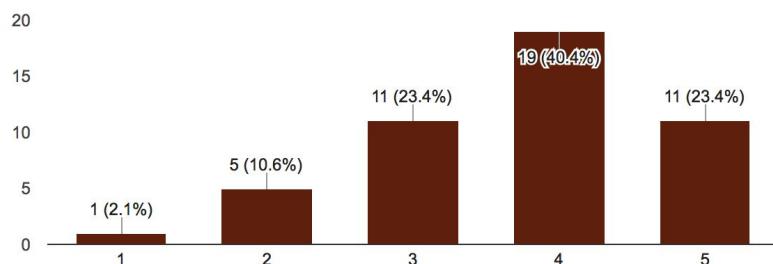
Figure 3.3

Would you be willing to download an app for this purpose? (47 responses)



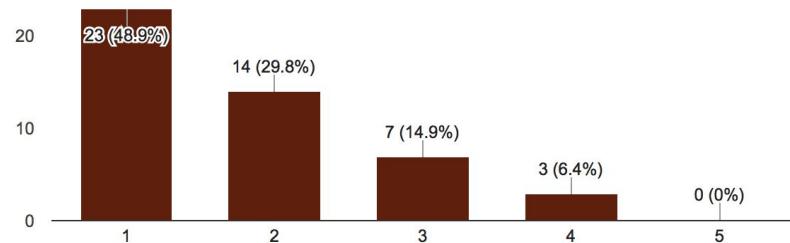
**Figure 3.4**

On a scale of 1 to 5, how much are your restaurant/café choices influenced by online reviews?  
(47 responses)



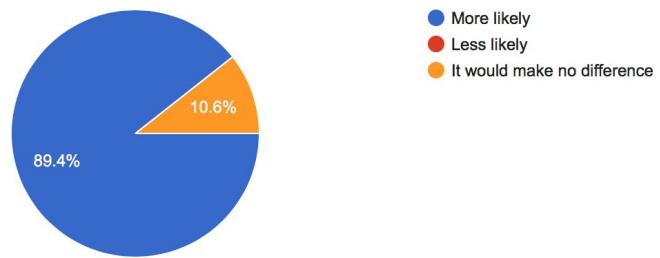
**Figure 3.5**

On a scale of 1 to 5, how often do you leave online feedback for the restaurants/cafés you have visited?  
(47 responses)



**Figure 3.6**

Would you be more or less likely to leave online feedback if discount incentives were offered on your next visit?  
(47 responses)



**Figure 3.7**

#### APPENDIX C: STRUCTURED QUESTIONING OF A RESTAURANT SUPERVISOR

**Q1. What system does your organisation currently use to manage food ordering?**

We currently use a manual system where waiters take orders from customers sat at tables by noting them down at the tableside, then entering them into one of the tills at the main bar. The order details are then viewable on a monitor in the kitchen, along with all the other orders, and can be checked off when cooked and ready to serve. The food is then taken from the kitchen to the customer's table.

**Q2. Could you provide a series of steps showing how exactly all of these interactions take place?**

1. Customer enters restaurant.
2. Customer is shown to table.
3. Waiter notes down order details at the tableside.
4. Waiter enters the order details into a till at the bar.
  - a. If this is the first time the customer has ordered food, create a new table record for them in the system.
  - b. Add each of the menu items the customer requested to their table's list of orders.
5. Kitchen staff view ordered items on the kitchen monitor.
6. Kitchen staff mark item as in-progress.
7. Kitchen staff cook food.
8. Kitchen staff mark order as cooked.
9. Waiter collects food from kitchen and delivers it to the customer's table.
10. Waiter marks order as complete.
11. Customer asks for the bill.
12. Waiter closes customer's table record, finalising bill.
13. Waiter collects payment from customer.
14. Waiter verifies payment.
15. Waiter closes the table record for the customer's visit.

Steps 3-10 are completed for as many orders as the customer wishes to make during their visit.

**Q3. What issues, if any, occur when interfacing between the customer and the kitchen staff?**

Problems usually occur when waiters mishear or misinterpret what customers order. Quite often customers will specify changes from the set menu which, which may also be misinterpreted or not communicated through to the kitchen properly.

A lot of time is also wasted in the two-step process of collecting the order and then entering it into the system. The two-step process also compounds the issue of detail being lost when it comes to bespoke orders.

**Q4. What improvements would you like to see introduced in a revised system, when it comes to interfacing between the kitchen staff and the customers?**

It would be great to be able to send orders from the customers to the kitchen in one step, since it would save time and help reduce how many mistakes the waiters make. Other than that, it would be good if the customer could more easily check the progress of their order, since we often get a lot of waiters having to waste time because customers ask them to check on their orders for them.

**Q5. How does your organisation currently handle gathering feedback?**

We currently have a web form which we ask customers to fill in online once they have finished their meal, a link to which is printed on their receipt, and is emailed regularly to our registered customers. This is paired with customers giving feedback in person during or after their meals, many complaints

are made in person.

<https://www.jdwetherspoon.com/contact/get-in-touch>

**Q6. Have you experienced any positive or negative effects as a result of customers using third-party review services, such as TripAdvisor? Do you feel that these services are useful to you or the customers?**

I've never heard anyone say that they've found us through such a service, but we usually have generally good reviews on the most prominent ones, which I could definitely see helping to persuade some of our customers into eating with us. A problem I can see with them, and one I have seen on numerous occasions, is that it'd be easy to post a fake review, or exaggerate a bad experience. This isn't useful for us or the customers since it doesn't give a faithful representation of our restaurant and can highlight problems to managers which don't actually exist.

**Q7. Can you see any potential benefits/difficulties with allowing a customer to order from their mobile phone?**

I think that getting the customer to use their own phone for ordering would be a great idea, since it would let them place their orders directly into the system without needing a waiter. It would reduce errors made in ordering, as long as the users could still specify changes from the set menu, as well as saving time since orders will be sent to the kitchen instantly.

However, allowing customers to do this might make the role of a waiter somewhat more redundant, as a large part of their workload would be automated. This may require redundancies to be made, at the very least it would need a waiter's role to be radically redefined.

**Q8. Does your company already incentivise feedback? Do incentives seem to improve feedback frequency and/or quality?**

We currently offer discount codes on customers' receipts which can be redeemed once they show us that they have filled out our online feedback form. I can't say how good the feedback is, I don't have access to the data myself, but a lot of people use the vouchers and show us that they've filled out the form when they pay, so the incentives definitely seem to help us get a lot of responses.

**Q9. How could an automated system help you improve the amount of feedback that you receive, and the improve the quality of that feedback?**

An automated system could prompt users to leave a review after they have had a meal at the restaurant, after paying, which would ensure that the customer had actually eaten here before leaving a review. If you could integrate our voucher offers, somehow awarding vouchers to customers to use next time they eat here whenever they submit a review, that would be easier than getting customers to prove to us that they have filled out our online form, as well as showing us the receipt etc. They would probably be more likely to leave feedback then since it is less trouble.

## APPENDIX D: PERSONAS

### Customer view: (Different types - young/old/, own phone/don't own phone etc)

- **Name:** Rowan | **Age:** 22 | **Gender:** Male | **Occupation:** Student
- **Background/frustrations:** Rowan is an engineering student in Manchester. Aside from studying, he is an avid music and technology fan and often travels far to see gigs. He is currently learning to play electric guitar. Rowan often eats out in restaurants for quick meals before concerts in the evening. He likes to keep in touch with his friends back home using his smartphone and social media. He hates slow service in restaurants as he likes to get to gigs early as the doors open. He also likes archery and often goes on university socials. Any time a new piece of technology comes out he has to be the first to use it. He likes The Gadget Show and is quick to look for ways technology can make his life easier, such as turning his phone into his daily fitness planner.
  
- **Name:** Betty | **Age:** 76 | **Gender:** Female | **Occupation:** Retired
- **Background/frustrations:** Betty is a retired hairdresser; she doesn't use technology very often although she does have a mobile phone (non-smartphone) and a computer for keeping in contact with friends living abroad via email. Betty goes out for a meal with her daughter (age 43) every week. She doesn't mind waiting for a meal as she likes the opportunity to talk with her daughter about her week. Betty however does have dietary concerns due to developing medical conditions and has had poor eyesight for a long time.

### Restaurant Owner:

- **Name:** Antonio | **Age:** 61 | **Gender:** Male | **Occupation:** Restaurant Owner
- **Background/frustrations:** Antonio is the majority stakeholder and owner of a moderately sized Italian restaurant in central Bath. Having moved to Bath from rural Italy as a child, nearly fifty years ago, Antonio's father started renting and later bought the restaurant building, which was later passed on to him. Because of this, Antonio prides himself on offering an authentic experience in this restaurant; from having waiters take orders from customers by hand using pen and paper, to having all food cooked from scratch in the kitchens from raw ingredients. Because of his age, Antonio no longer takes an active role in the day-to-day running of the restaurant, overseeing the back-end accounting and long-term policy decisions for the restaurant. He has a large family, many of whom have a stake and/or work in the restaurant, and whose advice he trusts. He is a conventionalist, and strives to continue to keep to traditional methods where possible, but becomes frustrated when these slow methods cause large waiting times for the ever-growing peak-number of customers dining at his restaurant. Outside of work, Antonio enjoys gardening and visits his villa in Italy several times per year, delegating restaurant work to his eldest son while he is away.

### Waiter:

- **Name:** Lucy | **Age:** 25 | **Gender:** Female | **Occupation:** Waitress
- **Background/frustrations:** Lucy is a waitress and has worked at Prezzo for 2-3 years now in Oxford. She also lives and grew up near Oxford. She has worked in catering since she left school but soon she would like to start a part-time degree in Psychology while continuing to work. This is because she has decided she would like to move away from catering and Psychology is something that she has always wanted to pursue. As a waitress her life can be quite difficult if it is a particularly busy time of the year and she can often become overwhelmed by customers. It can often become difficult to keep track of orders which can lead to mistakes on her part making her job more stressful than it needs to be.

**Chefs (those cooking/processing orders):**

- **Name:** Jeremy | **Age:** 42 | **Gender:** Male | **Occupation:** Chef
- **Background/frustrations:** Jeremy is a chef who is currently working in Las Iguanas in Bath. He graduated from West Thames College in London, and has worked as a chef in various restaurants and cafes since. He decided to move to Bath because he thinks that Bath is beautiful and had many catering opportunities that he was interested in. In all of Jeremy's jobs, he has always found that waiters don't write down the correct order fairly frequently, a problem that is only exacerbated by the fact that he is partially sighted. Whenever a customer is not happy with their order because of the waiter's fault, Jeremy must prioritize making the correct dish, in order to keep the customer happy. This makes his job stressful sometimes, and he could do without the inconvenience.

## APPENDIX E: SCENARIOS

We realised at an early stage in our application's design that a user account system would be a fundamental requirement. This allows the user to keep track of restaurants they have visited, as well as viewing a list of reviews they have submitted previously. Such a system has to be well defined in terms of its requirements to ensure it has a clear purpose, and to guarantee there will be no ambiguity when it is implemented. It is not sufficient to simply state that our system will 'allow the user to create an account' - our requirements must explicitly define the information the user is asked for when registering, what information will be stored and how this data will be used. The process of logging in and creating an account was therefore elicited from existing systems, as seen in Appendix F, Requirements 1.1-1.2. Signing up and logging into a system using a password is a ubiquitous design pattern that all of our researched existing systems include, so it would make sense to follow their example in this area to avoid unnecessary confusion.

### Scenario 1: Login

**Prerequisites:** User has the appropriate application open (restaurant/customer) and is on the login page. Requires an Internet connection.

**Flow of Events:** They enter their username/restaurant id and password and then press login.

**Potential Problems:** They could enter one of the details incorrectly, the application will alert the user that one of the two details has been entered incorrectly.

**Upon Completion:** The user will be logged in to the relevant application and it will show the main page.

### Customer Scenario 1: Create Account

**Prerequisites:** User has the app open on the opening screen. Requires an Internet connection.

**Flow of Events:** The user will be asked to enter some of their details including their e-mail address, date of birth, gender. They will then be asked to enter a username and password for their account. They will then confirm and submit their details.

**Potential Problems:** They may leave fields blank or type in some details wrong. If a required field is left blank the user will be prompted to fill it in. If any details are invalid, for example an invalid e-mail address, then this will be highlighted on the screen to let the user know it is wrong.

**Upon Completion:** It will confirm that they have created their account and then give them the option to login.

### Customer Scenario 2: Order Food

**Prerequisites:** Must be logged into the app, on the main page. Requires an Internet connection.

**Flow of Events:** The user browses the list of restaurants. They then select the restaurant they are eating at. It will then display the restaurant's information and their menu. The user then adds the food they want. The user then proceeds to pay for their order by pressing the checkout button. Now they enter their payment details and complete the order. A confirmation of the order will then appear on the screen.

**Potential Problems:** They could add the wrong food to the order, if the order is not yet completed they can go back to change the order. If the order has already been confirmed, then it will have to be fixed outside of the app. Although, this could depend on the restaurant's policy if they can change their order or get a refund. The user could also enter their payment details wrong or the payment method is invalid, if this is the case then the app will alert the user that the order could not be processed so they can change their details.

**Upon Completion:** The user will have completed their order and the restaurant will have received it so they can start preparing the food.

### **Staff Scenario 1: Update Restaurant Information**

**Prerequisites:** The user must be logged into the restaurant application in the administration view. Requires an Internet connection.

**Flow of Events:** The user will select 'Edit Restaurant Details' and they will have the option to edit the name, password, restaurant menu, discounts, location and opening hours. They then edit the information they want in the relevant fields. The user then clicks 'Next', they can then review the changes they have made to ensure they are right. They then click 'Confirm'.

**Potential Problems:** They could enter the new details incorrectly but on the next where they review the information they should realise any mistakes and fix them.

**Upon Completion:** It will be back on the main page having just confirmed the details.

### **Staff Scenario 2: View Orders**

**Prerequisites:** The user must be logged into the restaurant in either kitchen or waiter/administrative view. Requires an Internet connection.

**Flow of Events:** The user will select 'View Current Orders' from the main page. The page will then display all current orders.

**Upon Completion:** The page will show a list of all current orders including what their status is whether it is new, in progress or complete.

## APPENDIX F: FUNCTIONAL REQUIREMENTS

<b>1. Customer Application</b>		
<b>1.1</b>	<b>Allow Users to Create an Account</b>	<b>Priority:</b> HIGH
	Users should be able to access the account creation process through the application. Users will be required to enter their email address, date of birth, gender, then choose a username and password.	<b>Source:</b> Existing Systems Research  <b>Dependencies:</b> 3.2, 3.2.1, 3.2.2, 3.2.3
<b>1.1.1</b>	<b>Store Username and Password</b>	<b>Priority:</b> LOW
	The app should be able to remember the entered username and password at the user's request.	<b>Source:</b> Existing Systems Research  <b>Dependencies:</b> 1.1
<b>1.1.2</b>	<b>Display User's Purchase History</b>	<b>Priority:</b> HIGH
	The application should be able to retrieve the user's purchase history from the backend and display it to the user.	<b>Source:</b> Existing Systems Research  <b>Dependencies:</b> 1.1.1, 3.4
<b>1.1.3</b>	<b>Display User's Visited Restaurants</b>	<b>Priority:</b> HIGH
	The application should be able to retrieve a list of all the restaurants that the user has made purchases at and display it to the user.	<b>Source:</b> Existing Systems Research  <b>Dependencies:</b> 1.1, 1.1.2, 3.2.5
<b>1.1.4</b>	<b>Display User Submitted Reviews</b>	<b>Priority:</b> MEDIUM
	The application should be able to retrieve any reviews submitted by the user and display them to the user.	<b>Source:</b> Existing Systems Research  <b>Dependencies:</b> 1.1, 1.1.2, 3.5
<b>1.2.1</b>	<b>Allow User to Edit Profile</b>	<b>Priority:</b> HIGH
	Users should be able to make changes to their profile, such as changing password/username	<b>Source:</b> Existing Systems Research  <b>Dependencies:</b> 1.2

<b>1.2.2</b>	<b>Allow User to Delete Profile</b>	<b>Priority:</b> LOW
	Users should be able to delete their profile. This would give the users the option to also delete their reviews.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 1.2

<b>1.3</b>	<b>Access Restaurant Browser</b>	<b>Priority:</b> HIGH
	User's should be able to access a list of restaurants that use Gastroview.	<b>Source:</b> High Level Task Analysis Diagram
		<b>Dependencies:</b> 1.2, 3.1
<b>1.3.1</b>	<b>Search By Location</b>	<b>Priority:</b> MEDIUM
	The user can choose to search for restaurants within a place they are not currently located.	<b>Source:</b> High Level Task Analysis Diagram
		<b>Dependencies:</b> 1.2, 1.3, 3.1.5
<b>1.3.2</b>	<b>Search By Keyword</b>	<b>Priority:</b> HIGH
	The user can search the restaurant browser for specific restaurants, using a keyword.	<b>Source:</b> High Level Task Analysis Diagram
		<b>Dependencies:</b> 1.2, 1.3, 3.1
<b>1.3.3</b>	<b>Search By Category</b>	<b>Priority:</b> MEDIUM
	The user can filter the list to show only restaurants of a specific type, this would be things such as type of food.	<b>Source:</b> High Level Task Analysis Diagram
		<b>Dependencies:</b> 1.2, 1.3, 3.1
<b>1.3.4</b>	<b>Sort by Rating</b>	<b>Priority:</b> HIGH
	The restaurant browser can be ordered by the average user rating of the restaurant (star rating).	<b>Source:</b> High Level Task Analysis Diagram
		<b>Dependencies:</b> 1.2, 1.3, 3.5
<b>1.3.5</b>	<b>Sort by Location</b>	<b>Priority:</b> HIGH
	The user can choose to search all restaurants within a chosen radius of their current location.	<b>Source:</b> High Level Task Analysis Diagram
		<b>Dependencies:</b> 1.2, 1.3, 3.1.5

1.4	<b>View Restaurant Details</b>	<b>Priority:</b> HIGH
	The user can select a restaurant from a list, and view the details of that restaurant on an information page.	<b>Source:</b> High Level Task Analysis Diagram
		<b>Dependencies:</b> 1.3, 3.2
1.4.1	<b>View User Reviews</b>	<b>Priority:</b> HIGH
	The user should be able to select a restaurant from the list and view user reviews for that restaurant, in a similar fashion to viewing restaurant details.	<b>Source:</b> Survey Results
		<b>Dependencies:</b> 1.4, 3.5
1.4.2	<b>View Restaurant Location on Map</b>	<b>Priority:</b> HIGH
	The user is able to see on a geographical map where they are in relation to a restaurant.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 1.4, 3.1.5
1.4.3	<b>View Discounts Available at Restaurant</b>	<b>Priority:</b> MEDIUM
	The user is able to see the potential discounts that a restaurant offers in return for a review.	<b>Source:</b> Survey Results
		<b>Dependencies:</b> 1.4, 3.3

1.5	<b>Access Ordering System</b>	<b>Priority:</b> HIGH
	The user is able to progress to an ordering stage if the restaurant allows for ordering in advance. If not, the user can access this from their table.	<b>Source:</b> High Level Task Analysis Diagram
		<b>Dependencies:</b> 1.4
1.5.1	<b>Browse Restaurant Menu</b>	<b>Priority:</b> HIGH
	The user can look at a menu for a restaurant before ordering to see which foods are available, and whether they can order these in advance.	<b>Source:</b> High Level Task Analysis Diagram
		<b>Dependencies:</b> 1.5, 3.1.3
1.5.2	<b>View Menu Item Details</b>	<b>Priority:</b> HIGH
	The user can view details on menu items. This would be a more in-depth description of the food as well as any dietary information concerning that particular item.	<b>Source:</b> Interview
		<b>Dependencies:</b> 1.5.1, 3.1.3
1.5.3	<b>Applying Offers and Discounts</b>	<b>Priority:</b> HIGH

	The user should be able to apply any discounts that have been credited to their account, as well as any offers provided by the restaurant to all their customers.	<b>Source:</b> Survey Results  <b>Dependencies:</b> 1.4.3, 1.5, 3.1.4, 3.2.4
<b>1.5.4</b>	<b>Payment System</b>	<b>Priority:</b> HIGH
	The user should be able to pay for their order through the app using various payment methods.	<b>Source:</b> High Level Task Analysis Diagram  <b>Dependencies:</b> 1.5, 1.5.5
<b>1.5.5</b>	<b>Submitting an Order</b>	<b>Priority:</b> HIGH
	The user should be able to submit an order, which provides the restaurant with the user's order details.	<b>Source:</b> High Level Task Analysis Diagram  <b>Dependencies:</b> 1.5.1, 1.5.4, 3.4
<b>1.5.6</b>	<b>Track Order Progress</b>	<b>Priority:</b> HIGH
	The user can track their order from the application, whether it is being prepared, cooked, etc. This should also include an estimated time until the food being is ready.	<b>Source:</b> Existing Systems Research  <b>Dependencies:</b> 1.5.5, 3.4

<b>1.6</b>	<b>Submitting Reviews</b>	<b>Priority:</b> HIGH
	The user should be able to submit a review for a specific restaurant, including a rating out of 5 stars and a short explanation of their experience.	<b>Source:</b> Survey Results, High Level Task Analysis Diagram  <b>Dependencies:</b> 1.4.1, 1.5.5, 3.5
<b>1.6.1</b>	<b>Reviews Can Only Be Submitted After Payment</b>	<b>Priority:</b> HIGH
	Users should only be able to submit a review if they are confirmed to have made a purchase at the restaurant they are submitting a review for.	<b>Source:</b> Interview, Survey Results  <b>Dependencies:</b> 1.5.4, 1.5.5, 1.6, 3.4.3

<b>2. Restaurant Application</b>		
2.1	<b>Restaurant Login</b>	<b>Priority:</b> HIGH
	Users should be able to login using their restaurant's restaurant ID and password.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> N/A
2.2	<b>Application Choice</b>	<b>Priority:</b> HIGH
	Upon logging in, the users should be able to choose whether they would like to launch the kitchen application or the waiter/administration application.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 2.1
2.3	<b>Waiter/Administration View</b>	<b>Priority:</b> HIGH
	A view should be offered where waiters and management staff can view the status of orders, manage orders, and perform other administrative tasks.	<b>Source:</b> Interview
		<b>Dependencies:</b> 2.2
2.3.1	<b>Edit Restaurant Profile</b>	<b>Priority:</b> HIGH
	Users should be able to edit their restaurant's profile details.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 2.2, 3.1
2.3.1.1	<b>Edit Restaurant Name</b>	<b>Priority:</b> HIGH
	Users should be able to change their restaurant's displayed name.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 2.3.1
2.3.1.2	<b>Edit Restaurant Password</b>	<b>Priority:</b> HIGH
	Users should be able to change the password used to access their restaurant's account.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 2.3.1
2.3.1.3	<b>Edit Restaurant Menu</b>	<b>Priority:</b> HIGH
	Users should be able to edit menu items. They should be able to add/remove menu items, change menu item prices etc.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 2.3.1

<b>2.3.1.</b> 4	<b>Edit Restaurant Discounts</b>	<b>Priority:</b> HIGH
	Users should be able to add/remove their restaurant's discounts.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 2.3.1
<b>2.3.1.</b> 5	<b>Edit Restaurant Location</b>	<b>Priority:</b> HIGH
	Users should be able to change their restaurant's location.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 2.3.1
<b>2.3.1.</b> 6	<b>Edit Restaurant Opening Hours</b>	<b>Priority:</b> MEDIUM
	Users should be able to edit their restaurant's opening hours.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 2.3.1
<b>2.3.2</b>	<b>Delete Profile</b>	<b>Priority:</b> HIGH
	Users should be able to delete their restaurant and all related data from the system.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 2.3.1
<b>2.3.3.</b> 1	<b>Order List</b>	<b>Priority:</b> HIGH
	Users should be able to view a list of current orders (new, in progress, complete).	<b>Source:</b> Interview, Existing Systems Research
		<b>Dependencies:</b> 1.5.5, 3.4
<b>2.3.3.</b> 2	<b>Order States</b>	<b>Priority:</b> HIGH
	Users should be able to change the states of orders.	<b>Source:</b> Interview
		<b>Dependencies:</b> 1.5.5, 3.4
<b>2.3.4.</b> 1	<b>Payment Verification</b>	<b>Priority:</b> HIGH
	Users should be able to verify that a customer has paid for their order(s).	<b>Source:</b> Interview, Existing Systems Research
		<b>Dependencies:</b> 2.3.3.2, 1.5.5
<b>2.3.4.</b> 2	<b>Customer Verification</b>	<b>Priority:</b> HIGH
	After verifying that a user has paid for their orders, the relevant customer should be allowed to post a review for this restaurant.	<b>Source:</b> Interview, Existing Systems Research

		<b>Dependencies:</b> 2.3.4.1, 1.5.5, 3.4.3
2.4	<b>Kitchen View</b>	<b>Priority:</b> HIGH
	A view should be offered to users to allow kitchen staff to view a list of orders, as well as updating the state of these orders.	<b>Source:</b> Interview  <b>Dependencies:</b> 2.2
2.4.1	<b>View List of Orders</b>	<b>Priority:</b> HIGH
	Users should be able to view a list of currently active orders.	<b>Source:</b> Interview, Existing Systems Research  <b>Dependencies:</b> 1.5.5, 3.4
2.4.2	<b>Change Order State</b>	<b>Priority:</b> HIGH
	Users should be able to modify the state of an order to one of the following values: queued, cooking, ready, served, closed.	<b>Source:</b> Interview  <b>Dependencies:</b> 1.5.5, 3.4
2.5	<b>Table Management</b>	<b>Priority:</b> HIGH
	Users should be able to add, remove view the status and change the status of tables.	<b>Source:</b> Design Phase, Restuarant Medium Fidelity Prototypes  <b>Dependencies:</b> N/A
2.5.1	<b>Table Location</b>	<b>Priority:</b> HIGH
	Users should be able to edit the location of a table.	<b>Source:</b> Design Phase, Restuarant Medium Fidelity Prototypes  <b>Dependencies:</b> 2.5
2.5.2	<b>Table Occupation</b>	<b>Priority:</b> HIGH
	Users should be able to view and change whether or not a table is occupied.	<b>Source:</b> Design Phase, Restuarant Medium Fidelity Prototypes  <b>Dependencies:</b> 2.5
2.5.3	<b>Add/Remove Tables</b>	<b>Priority:</b> HIGH
	Users should be able to add/remove tables.	<b>Source:</b> Design Phase, Restuarant Medium Fidelity Prototypes

		<b>Dependencies:</b> 2.5
2.6	<b>Add Options &amp; Types to Menu Items</b>	<b>Priority:</b> HIGH
	users should be able to add additional options to menu items - types e.g. Large, Small, Medium Rare; options e.g. Pickles, Sauce, Gravy.	<b>Source:</b> Design Phase, Restuarant Medium Fidelity Prototypes
		<b>Dependencies:</b> 2.3.1.3
2.5.3	<b>Flat &amp; Percentage Discounts</b>	<b>Priority:</b> HIGH
	Discounts should be either percentage based (e.g. 10% off) or flat price (£2 off).	<b>Source:</b> Design Phase, Restuarant Medium Fidelity Prototypes
		<b>Dependencies:</b> 2.3.1.4

<b>3. Backend Application</b>		
3.1	<b>Manage Restaurant Profiles</b>	<b>Priority:</b> HIGH
	Ensure that a restaurant can have its details stored on the application for a user to view.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> N/A
3.1.1	<b>Store Restaurant Name</b>	<b>Priority:</b> HIGH
	The system should store restaurant names in the central database.	<b>Source:</b> Existing Systems Research <b>Dependencies:</b> 3.1
3.1.2	<b>Store Restaurant Password</b>	<b>Priority:</b> HIGH
	Passwords themselves should not be stored. Salted hashing should be used for password verification.	<b>Source:</b> Existing Systems Research, Legal Requirement to Store Data Securely <b>Dependencies:</b> 3.1
3.1.3	<b>Store Restaurant Menu</b>	<b>Priority:</b> HIGH
	The system should store restaurant menus in the central database.	<b>Source:</b> Existing Systems Research <b>Dependencies:</b> 3.1
3.1.4	<b>Store Restaurant Discounts</b>	<b>Priority:</b> MEDIUM
	The system should store restaurant discounts in the central database.	<b>Source:</b> Existing Systems Research <b>Dependencies:</b> 3.1
3.1.5	<b>Store Restaurant Location</b>	<b>Priority:</b> HIGH
	The system should store restaurant locations in the central database.	<b>Source:</b> Existing Systems Research <b>Dependencies:</b> 3.1
3.1.6	<b>Store Restaurant Opening Hours</b>	<b>Priority:</b> HIGH
	The system should store restaurant opening and closing hours in the central database.	<b>Source:</b> Existing Systems Research <b>Dependencies:</b> 3.1
3.2	<b>Manage User Profiles</b>	<b>Priority:</b> HIGH
	Users should be able to have an account with the system allowing them to post reviews and receive discounts associated with that account.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> N/A

<b>3.2.1</b>	<b>Store User Name</b>	<b>Priority:</b> HIGH
	The system should store restaurant discounts in the central database.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 3.2
<b>3.2.2</b>	<b>Store Email Address</b>	<b>Priority:</b> HIGH
	The system should store user email addresses in a database.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 3.2
<b>3.2.3</b>	<b>Store User Password</b>	<b>Priority:</b> HIGH
	Passwords themselves should not be stored. Salted hashing should be used for password verification.	<b>Source:</b> Existing Systems Research, Legal Requirement to Store Data Securely
		<b>Dependencies:</b> 3.2
<b>3.2.4</b>	<b>Store User Discounts</b>	<b>Priority:</b> MEDIUM
	Store all of the discounts that a user is able to redeem.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 3.2
<b>3.2.5</b>	<b>Store User Visited Restaurants</b>	<b>Priority:</b> HIGH
	Store a record of all of the restaurants that a user has visited.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 3.2
<b>3.3</b>	<b>Marketing Emails</b>	<b>Priority:</b> MEDIUM
	Sending marketing emails to customers that have already visited.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 3.2.2
<b>3.4</b>	<b>Storing Orders</b>	<b>Priority:</b> HIGH
	System must store order details in a database.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> N/A
<b>3.4.1</b>	<b>Store Order Menu Item(s)</b>	<b>Priority:</b> HIGH
	System must store the menu item(s) related to an order.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 3.4
<b>3.4.2</b>	<b>Store Customer of Order</b>	<b>Priority:</b> HIGH
	Store customer who placed the order.	<b>Source:</b> Existing Systems Research

		<b>Dependencies:</b> 3.4
3.4.3	<b>Store Payment Verified</b>	<b>Priority:</b> HIGH
	Store whether or not the order has been paid for.	<b>Source:</b> Existing Systems Research
		<b>Dependencies:</b> 3.4
3.5	<b>Store Reviews</b>	<b>Priority:</b> HIGH
	Store reviews that users have left for restaurants.	<b>Source:</b> Interview, Survey, Existing Systems Research
		<b>Dependencies:</b> N/A
3.5.1	<b>Store Reviewed Restaurant</b>	<b>Priority:</b> HIGH
	Store the restuarant that the review has been left for.	<b>Source:</b> Interview, Survey, Existing Systems Research
		<b>Dependencies:</b> 3.5
3.5.2	<b>Store Review User</b>	<b>Priority:</b> MEDIUM
	Store the user who posted that review.	<b>Source:</b> Interview, Survey, Existing Systems Research
		<b>Dependencies:</b> 3.5, 3.2
3.5.3	<b>Store Review Ratings</b>	<b>Priority:</b> HIGH
	Store the ratings that the user left for the restaurant.	<b>Source:</b> Interview, Survey, Existing Systems Research
		<b>Dependencies:</b> 3.5
3.5.4	<b>Store Review Feedback</b>	<b>Priority:</b> HIGH
	Store the textual feedback that the user left as part of the review.	<b>Source:</b> Interview, Survey, Existing Systems Research
		<b>Dependencies:</b> 3.5

## APPENDIX G: NON-FUNCTIONAL REQUIREMENTS

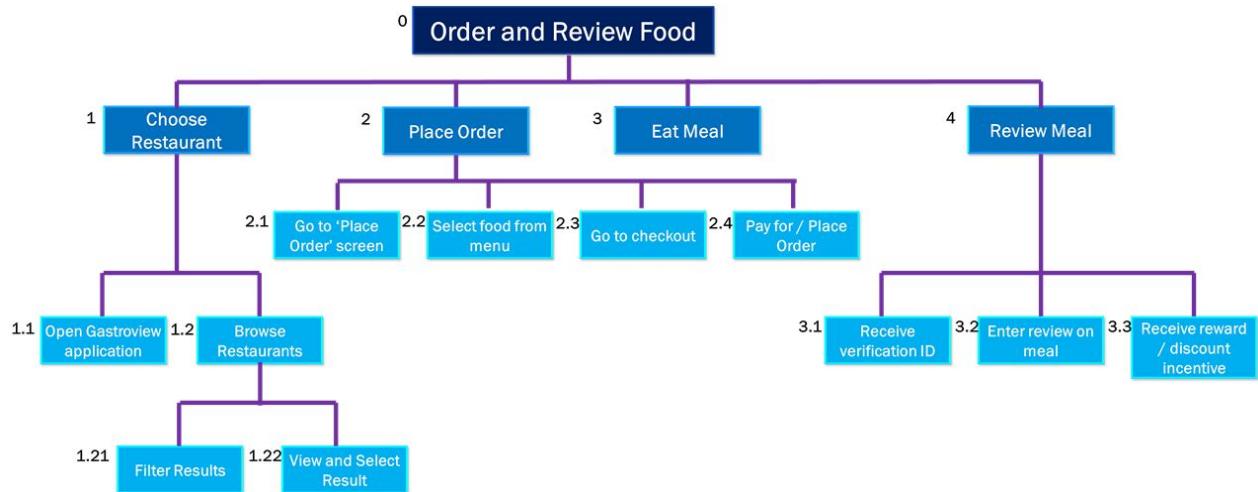
<b>4. Project Management</b>		
<b>4. 1</b>	<b>The team must use an agile software development methodology</b>	<b>Priority:</b> HIGH
	We should use an iterative approach to development, regularly re-assessing the project's progress and direction.	<b>Source:</b> .Project Specification <b>Dependencies:</b> N/A
<b>4. 2</b>	<b>During development, team must regularly review the functional requirements</b>	<b>Priority:</b> HIGH
	Every week, scrum meetings will take place. These meetings will give scope for requirements to be adapted to the users' needs, as the team's understanding of the problem develops.	<b>Source:</b> Group Discussion <b>Dependencies:</b> 4.1
<b>4. 3</b>	<b>Team must analyse risks during the iterative process</b>	<b>Priority:</b> HIGH
	Risk management must be undertaken as an ongoing iterative process. At each meeting, based on the decisions made, risks will be logged in a Risk Monitoring document, with appropriate actions and their possible impact.	<b>Source:</b> Group Discussion <b>Dependencies:</b> 4.1
<b>4. 4</b>	<b>Comply with the 8 principles of the Data Protection Act 1998</b>	<b>Priority:</b> HIGH
	Data must be: <ul style="list-style-type: none"> <li>• used fairly and lawfully,</li> <li>• used for limited, specifically stated purposes,</li> <li>• used in a way that is adequate, relevant and not excessive,</li> <li>• accurate.</li> <li>• kept for no longer than is absolutely necessary.</li> <li>• handled according to people's data protection rights.</li> <li>• kept safe and secure.</li> </ul>	<b>Source:</b> Academic Research, Group Discussion <b>Dependencies:</b> N/A
<b>4. 5</b>	<b>Use Prototypes to Obtain User Feedback</b>	<b>Priority:</b> HIGH
	During development use a range of low and high fidelity prototypes to obtain detailed feedback from users.	<b>Source:</b> Group Discussion, Project Specification <b>Dependencies:</b> 4.1
<b>4.</b>	<b>Regular user feedback during testing</b>	<b>Priority:</b> HIGH

<b>6</b>	Acquiring regular user feedback for the current version of the system will allow for more requirements to be written, and for the team to understand the users' expectations of the system.	<b>Source:</b> Group Discussion
		<b>Dependencies:</b> 4.1

<b>5. Application Requirements</b>		
<b>5.1</b>	<b>Client-Server Model</b>	<b>Priority:</b> HIGH
	The system should follow the client-server model, with clients for the different users all accessing a central server.	<b>Source:</b> Group Discussion, Existing Systems Research  <b>Dependencies:</b> N/A
<b>5.2</b>	<b>Accessible Colour Scheme</b>	<b>Priority:</b> MEDIUM
	A high contrast of colours must be used in the interface in order for users with poor vision to be able to read text, and understand how to navigate the application.	<b>Source:</b> Personas, Existing Systems Research  <b>Dependencies:</b> 5.6, 5.5
<b>5.3</b>	<b>Mobile Compatibility</b>	<b>Priority:</b> HIGH
	The application should be able to run on mobile devices.	<b>Source:</b> Group Discussion, Existing Systems Research  <b>Dependencies:</b> N/A
<b>5.4</b>	<b>Application should connect to server over the Internet</b>	<b>Priority:</b> HIGH
	The application should be able connect to a central server over the Internet.	<b>Source:</b> Existing Systems Research  <b>Dependencies:</b> 5.1
<b>5.5</b>	<b>Application interface must be designed for a range of users</b>	<b>Priority:</b> HIGH
	The application must cater to all types of users whether they have little or a lot of experience using technology, this means it must be easy enough to use so that someone who has potentially never used a mobile app could use it.	<b>Source:</b> Existing System Research, Personas  <b>Dependencies:</b> N/A
<b>5.6</b>	<b>Application interface must be aesthetically pleasing</b>	<b>Priority:</b> HIGH
	The user interface must be aesthetically pleasing, as well as intuitive to use. A pleasing interface will improve users' experiences, and will allow them to properly use and understand the application.	<b>Source:</b> Personas  <b>Dependencies:</b> N/A
<b>5.7</b>	<b>Navigation and Action Controls should be clearly labelled.</b>	<b>Priority:</b> HIGH

	<p>Controls used to navigate the application and perform essential actions should be labelled clearly, i.e. it should be obvious to an inexperienced user what they do.</p>	<p><b>Source:</b> Personas</p>
		<p><b>Dependencies:</b> N/A</p>

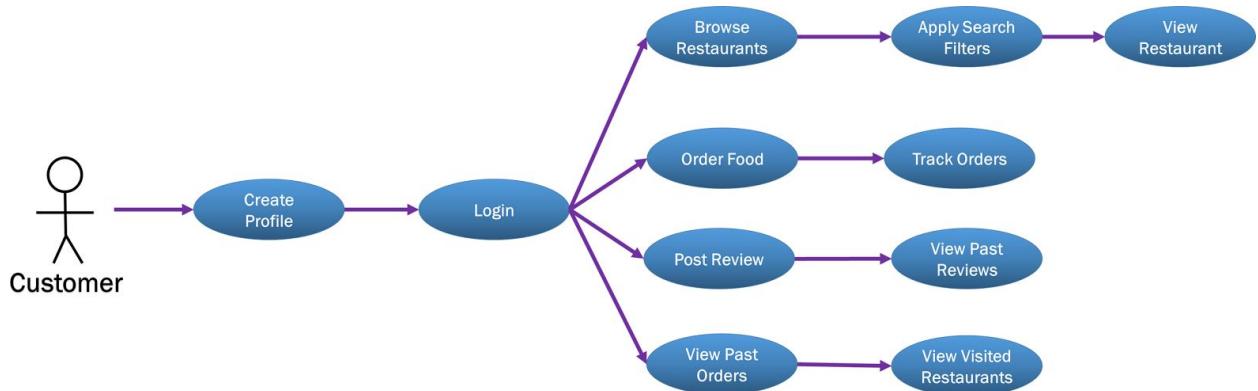
## APPENDIX H: HIGH LEVEL TASK ANALYSIS DIAGRAM

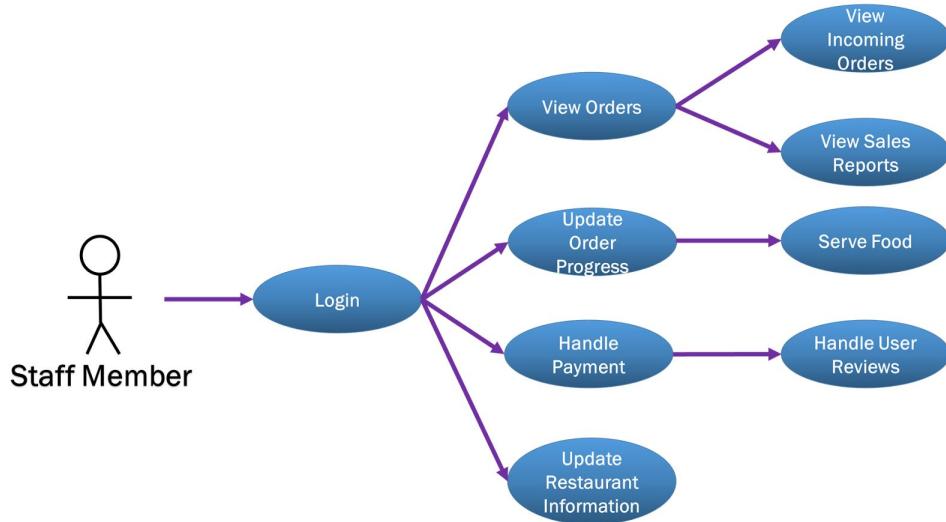


This is a High Level Task Analysis Diagram for the ordering and reviewing process. It breaks down the stages a user will go through from start to finish using our application - the user chooses a restaurant, places their order and is allowed to review their meal in return for a reward or incentive. Once a user has opened and logged into the application, they are presented with a list of restaurants filtered by location, rating and so on. The user then selects a restaurant from this list to view their address, menu, ratings, capacity, opening hours. Once they are happy with their choice, a user can place an order with the restaurant (in advance or at the table if allowed). After the meal, the user will be presented with a verification ID to ensure they are an authentic paying customer. Once a review is submitted, a user is presented with a reward by the restaurant on their account to be used again at the restaurant another time.

## APPENDIX I: USE CASE DIAGRAMS

For more detailed user scenarios, see Appendix E. These explore some of the different interactions within the system.





#### APPENDIX J: USER REQUIREMENTS DESCRIPTION & DETAIL

In order to better understand the views of our system's potential stakeholders, we carried out a short survey to verify whether our assumptions about the customer user groups' needs were valid (as shown in Appendix B), and to try and identify any user needs which we had not previously anticipated. The main goals of the questionnaire were to discover how many of our potential users already own a smartphone and if so, how many of them have used their smartphone to order food in a restaurant context. We also wanted to find out whether the review aspect of our system would be useful to our target users.

After 1 week, the survey received 47 responses from a variety of sources. Our results include responses from all of the specified age groups, though younger ranges such as 16-22 and 23-29 were the most prominent (Appendix B, Figure 3.1). This could introduce slight statistical bias, though we anticipated from the start that our system would be mainly used by a younger audience. The overwhelming majority (97.9%) of respondents already own a smartphone (Appendix B, Figure 3.2), therefore we don't feel this will be a major issue we have to consider when developing our system - although provision will need to be made for those who don't own such a device so that they are able to use the traditional methods of ordering within a restaurant. One of the sections on our questionnaire asked respondents whether they had ever used their smartphone to order food in advance, essentially to gain insight into how prevalent existing systems are. The findings in Appendix B, Figure 3.3 show that almost a third of users had used a similar system before, though the majority had not. Some examples users gave of restaurants which use existing systems include Wetherspoons, Gourmet Burger Kitchen and Mission Burrito, though 42.6% of our respondents said they were not aware of any restaurants that currently offer a similar system. With the majority of our respondents stating that they would be willing to download an app for this purpose (Appendix B, Figure 3.4), we are confident there is demand in the market for a system of this kind.

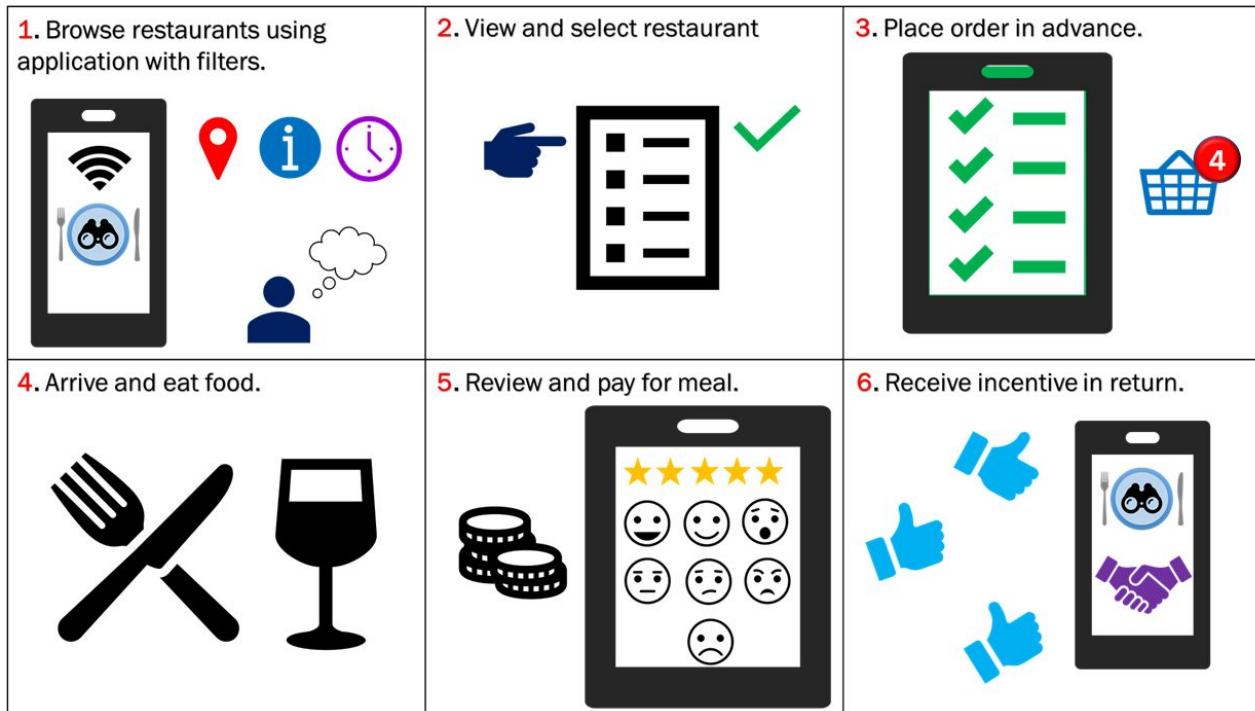
Further to this, our questionnaire asked users to rank on a scale of 1 to 5 how much their restaurant/café choices are influenced by online reviews, with 1 meaning 'not at all' and 5 meaning 'entirely'. Overall the mean response was 3.72 and the most occurring response was 4, which 40% of our respondents selected (Appendix B, Figure 3.5). This shows that on average, our respondents value the opinions of other users when deciding where to eat. This conclusion is a good justification of implementing user reviewing functionality in our proposed system. In contrast to this, almost half of our respondents said they never leave online feedback for the restaurants they have visited, as shown in Appendix B, Figure 3.6. This reveals a large disparity in how users interact with current restaurant review systems - reviews are relied on heavily, yet very few users are actually likely to submit their own. Our system aims to address this issue by offering discounts or incentives for users who submit reviews, as the survey results show that 89.4% of respondents would be more likely to submit feedback if this was implemented (Appendix B, Figure 3.7).

#### APPENDIX K: PERSONA METHODOLOGY

After analysing our data gathered from users, through activities such as our interview [Appendix C] and survey [Appendix B], it was found that the majority of the users were 'ideal' users, their views largely agreed with our system plans, and the majority (42.6%) of them were between the ages of 16 and 22 [Appendix B, 3.1]. A shortcoming in our survey questions also did not allow us to gather targeted feedback from user groups who would need more help in using a computerised system, such as the elderly and disabled.

In order to supplement our other data, we constructed personas [Appendix D] who provided insights into subsets of our user group who may not be 'ideal', for example they may be elderly or partially sighted. By introducing these imperfect users, we were able to target their needs and generate system requirements to make the system accessible to them.

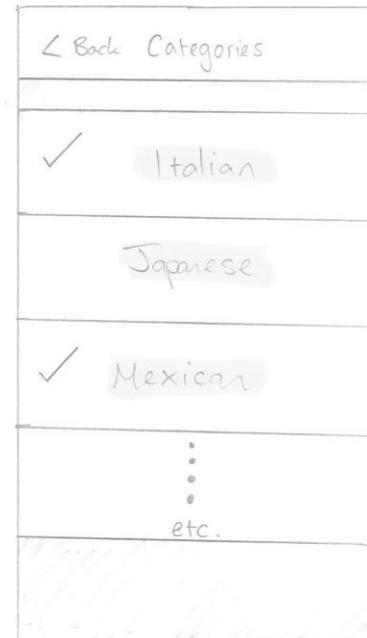
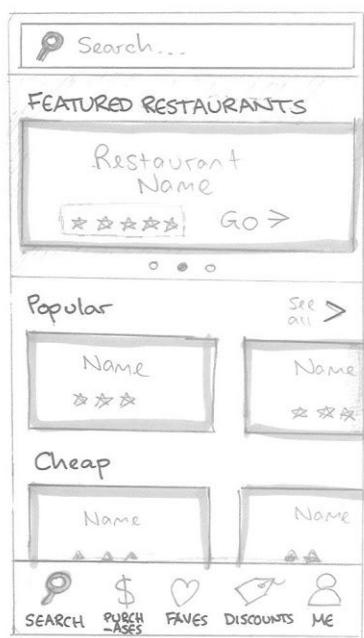
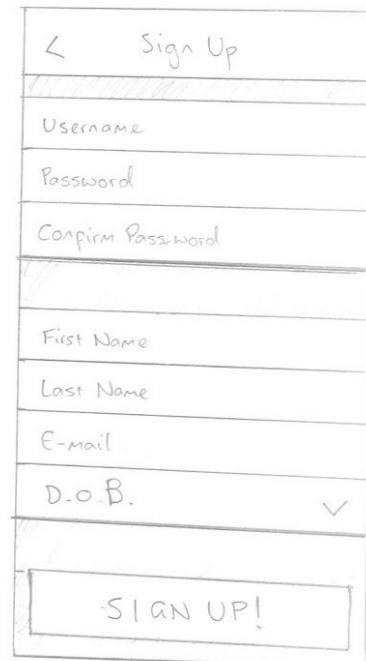
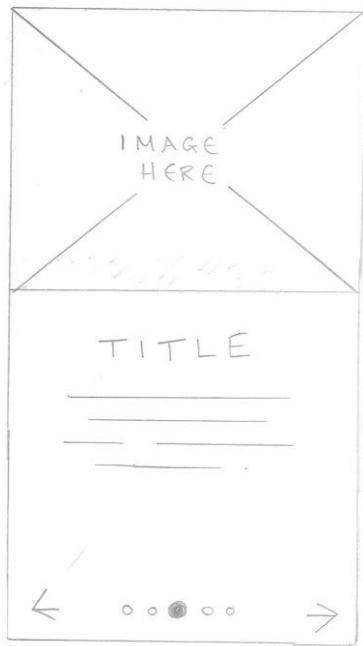
## APPENDIX L: CUSTOMER APPLICATION STORYBOARD

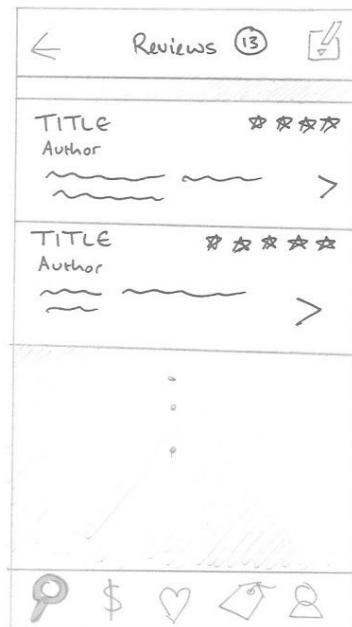
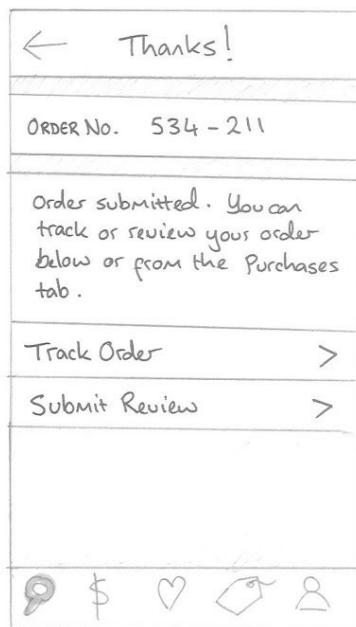
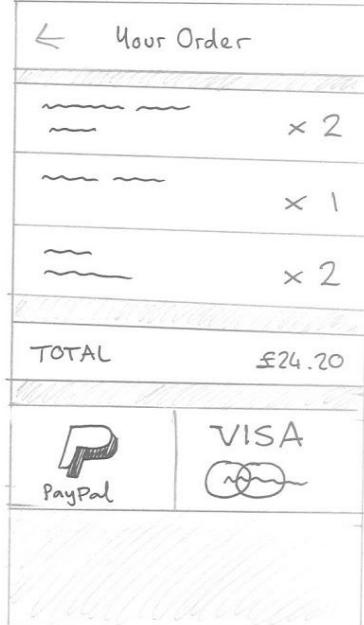
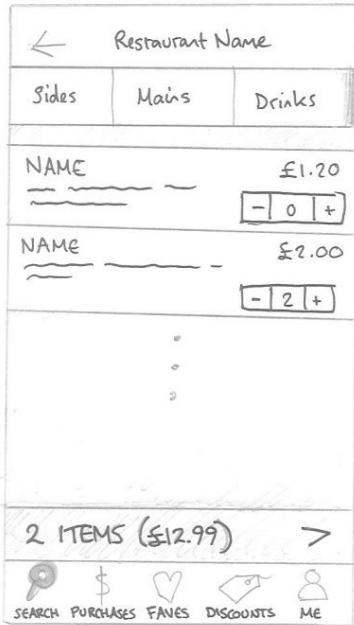


The customer side storyboard shows the stages the user goes through using the application as a series of simple sketches to communicate to any users taking part in our survey what is involved in a typical end user scenario with the application. First of all, a customer will use the application to browse restaurants using searches based on a number of criteria with particular filters applied, and sorting methods used. This is demonstrated in the first stage - customers can browse by location (distance), average time it takes to be served and eat a meal, rating, price, category and so on. Secondly, a user must select a restaurant to be taken to the ordering stage. Here, a user selects items from a menu in the style of a mental model - the shopping basket. Once the user has placed an order, they may arrive at the restaurant and eat their meal. Next, they pay for and review the meal using their application in order to receive a personal incentive for doing so. This incentive can take the form of a discount voucher or similar promotional gift at the restaurant's discretion.

The chosen user group was a group of students who were. This group was selected because they were readily available to us, they were part of a demographic who heavily took part in our survey [Appendix B], and many of them had taken part in previous requirements gathering activities for the project, so were at least somewhat familiar with the subject matter.

APPENDIX M: CUSTOMER APPLICATION LOW FIDELITY PROTOTYPE





#### APPENDIX N: CUSTOMER APPLICATION MEDIUM FIDELITY PROTOTYPES

A medium fidelity prototype of the customer application was created to show a general outline of what pages the customer application would include, and how each page is linked. This prototype was implemented as a powerpoint, with each slide representing a specific page in the proposed application, and hyperlinked buttons on each slide. When these buttons are clicked, the user is taken to a new slide, which gives the impression of interactivity without the need for any coding. For simplicity, not every button has functionality, but there is enough functionality for the prototype to be intuitive and informative. From interacting with this prototype, users will gain a good understanding of what functionality the proposed system will have, and will also get a feel for how the final product will operate. The idea of this prototype is to present the user with an interface and allow them to explore how the application would be navigated.

This prototype was demonstrated to users without assistance from a team member, as the idea of this prototype is to allow users to gain a feel for the proposed application as if they were using it themselves, and it is intuitive enough for a user to use by themselves. After interacting with this prototype, useful feedback was given as to how the prototype could be improved in order for it to match users' expectations. A comment that arose frequently from testers was that they would feel more comfortable interacting with the prototype if it was on a mobile phone, or was formatted as if it was on a mobile phone. This feedback became the basis of the prototype's second iteration. In the new prototype, each slide on the powerpoint was formatted on top of a smartphone template, to better simulate the experience of using the application on a mobile device. The first and second iterations of the customer application medium fidelity prototypes are shown as images below.

The user group used to gather feedback on these prototypes were a group of students who had been used to test the earlier generation prototypes, so that any changes that they had suggested and had been implemented could be shown to them and verified. It also ensured that they were somewhat familiar by this point with the subject matter.

Figure Set 1 - First Generation Prototype:

Gastroview: Customer login

Username:

Password:

**Login**      **Register**



Name: David

Email address: david@gmail.com

Date of Birth: 22/03/1994

Gender:  Male  Female

Username: example

Password: example

Confirm password: example

**Register**   **Cancel**



Welcome, David!

**Restaurant  
Browser**

**Purchase  
History**

**View Submitted  
Reviews**

**Edit Personal  
Information**

**Track Order**

**Log Out**



## Gastroview: Purchase History

[Back](#)

Restaurant name:	Date:	Total:
<b>Sotto Sotto</b>	12/12/2016	£35.50
<b>Ponte Vecchio</b>	21/12/2016	£28.70
<b>La Perla</b>	10/1/2017	£41.25
<b>Indian Temptation</b>	28/1/2017	£30.80



## Gastroview: Submitted Reviews

[Back](#)

### Your reviews

**Sotto Sotto** 

**Good food**

20/12/2016

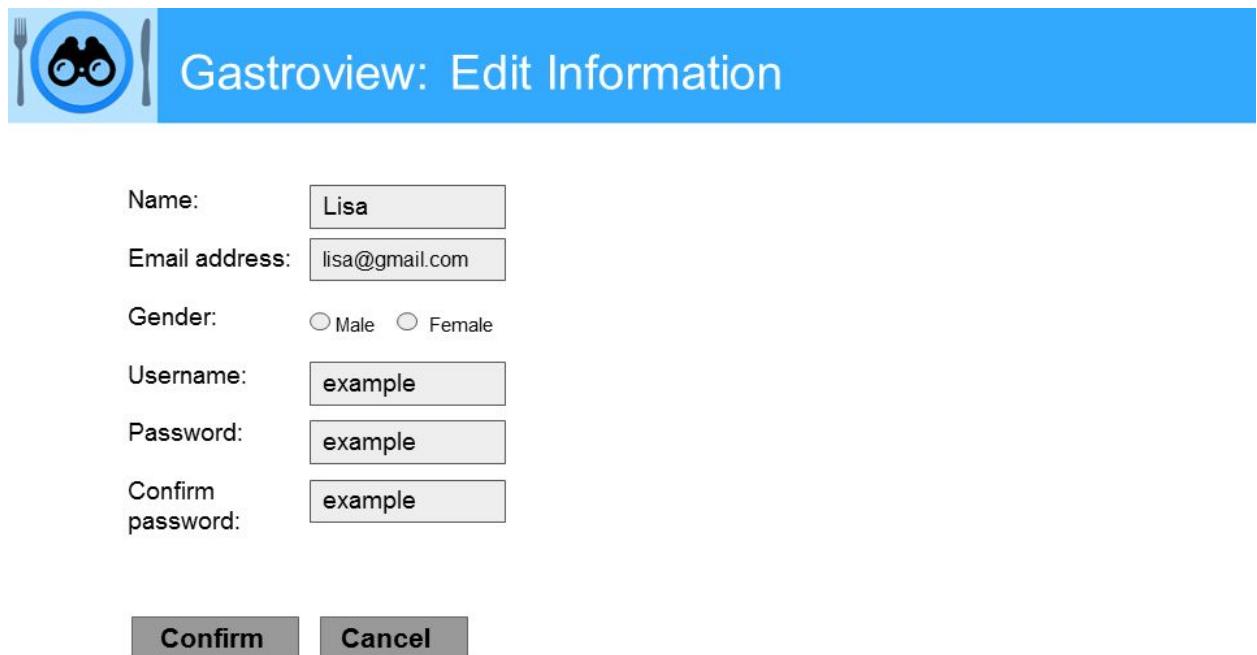
Had a good time with my fam but  
there was a weird smell tho

**La Perla** 

**Not really good food**

11/12/2016

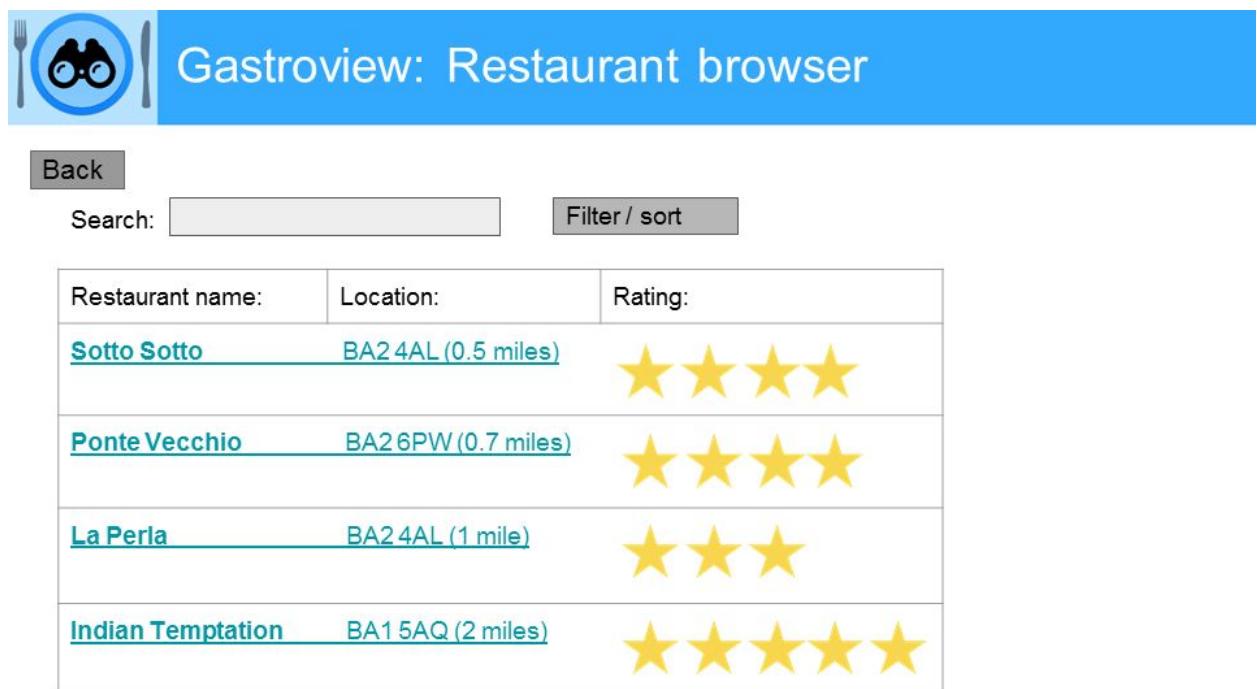
Food was pretty bad and waiter was  
rude not v good



**Gastroview: Edit Information**

Name:	Lisa
Email address:	lisa@gmail.com
Gender:	<input type="radio"/> Male <input type="radio"/> Female
Username:	example
Password:	example
Confirm password:	example

**Confirm**   **Cancel**



**Gastroview: Restaurant browser**

Restaurant name:	Location:	Rating:
<a href="#"><u>Sotto Sotto</u></a>	BA2 4AL (0.5 miles)	★★★★★
<a href="#"><u>Ponte Vecchio</u></a>	BA2 6PW (0.7 miles)	★★★★★
<a href="#"><u>La Perla</u></a>	BA2 4AL (1 mile)	★★★★
<a href="#"><u>Indian Temptation</u></a>	BA1 5AQ (2 miles)	★★★★★



## Gastroview: Restaurant filter / sort

[Back](#)**Filter by Categories:**

Fast food	<input checked="" type="checkbox"/>
Fast casual	<input type="checkbox"/>
Fine dining	<input checked="" type="checkbox"/>
Barbecue	<input type="checkbox"/>
...	<input type="checkbox"/>

**Sort:**

Rating	<input checked="" type="checkbox"/>
Distance	<input type="checkbox"/>
Pricing	<input type="checkbox"/>
...	<input type="checkbox"/>



## Gastroview: Restaurant viewer

[Back](#)Restaurant name 

Restaurant address

Opening times

[View Menu](#)[View on Map](#)[View Potential Discounts](#)**Reviews****Good food** 

Had a good time with my fam but there was a weird smell tho

**Bad restaurant** 

Stinky and nasty

## Gastroview: Restaurant viewer (Map)

[Back](#)



## Gastroview: Potential Discounts

[Back](#)

**£5 off when you spend £20 or more**

Valid for: 3 months

---

**10% off your next order**

Valid for: 3 months

---

**Free starter**

Valid for: 2 months

---

**Free side with your main**

Valid for: 2 months



Back

Menu

Order Food

Starters Mains Desserts Drinks

Item name £9.60

Description

- 0 +

Item name £8.00

Description

Can't order



Back

Which discount would you like to apply to your order?

**£5 off when you spend £20 or more**  
Valid for: 3 months

**Free starter**  
Valid for: 2 months

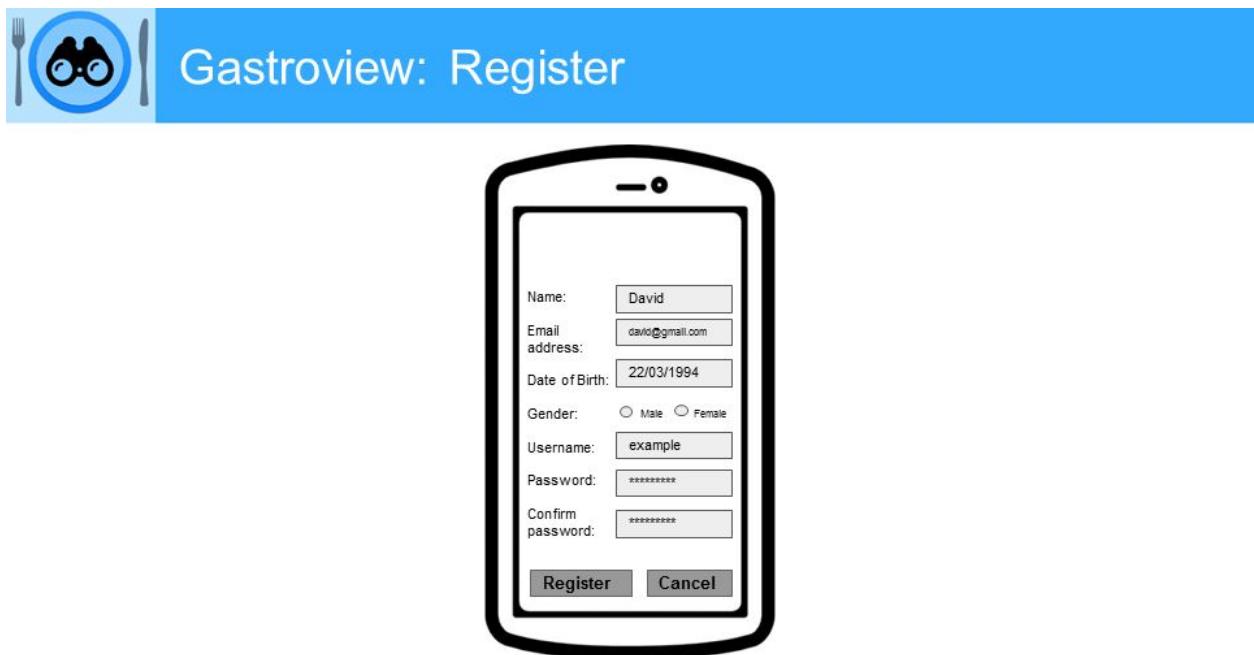
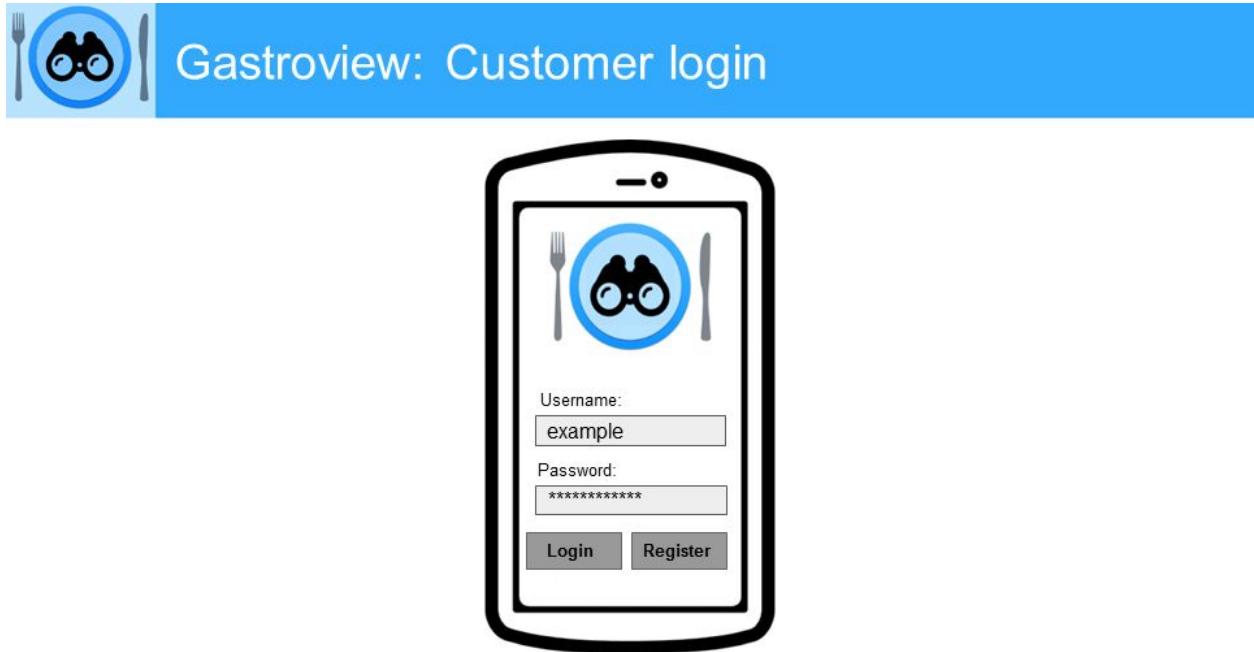


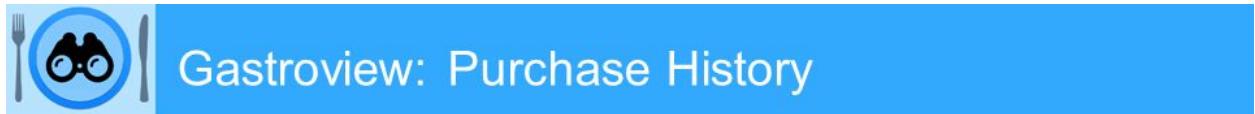
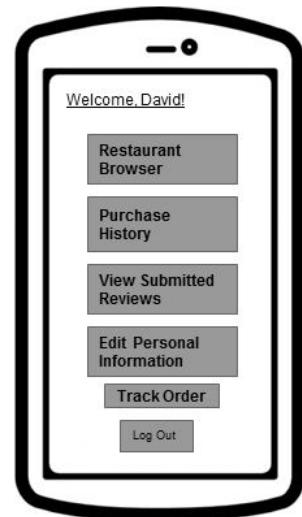
Continue to Payment

The screenshot shows a mobile application interface titled "Gastroview: Payment". At the top left is a blue circular icon containing a fork, a pair of binoculars, and a knife. To its right, the text "Gastroview: Payment" is displayed. Below this is a grey rectangular button labeled "Back". The main content area displays the text "Total to be paid: £42.60" and the instruction "Please choose a payment method:". Underneath, there are logos for PayPal (blue "P" with "PayPal" text), VISA (the word "VISA" above a red and yellow card), and MasterCard (the word "MasterCard" above a red and yellow card).

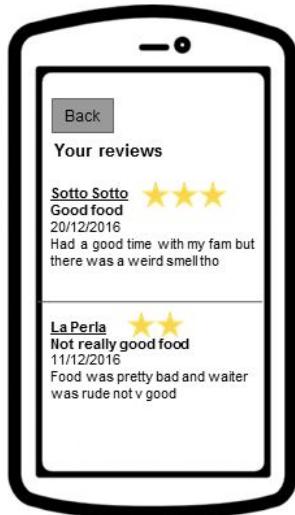
The screenshot shows a mobile application interface titled "Gastroview: Track Order". At the top left is a blue circular icon containing a fork, a pair of binoculars, and a knife. To its right, the text "Gastroview: Track Order" is displayed. The main content area contains the message "Thank you for your order! You can track the progress of your order, and check your table number below:" followed by the status "Status: Waiting", the estimated time "Estimated time until ready: 50 minutes", and the table number "Table number: 14". Below this is a grey rectangular button labeled "Home".

Figure Set 2 - Second Generation Prototype:

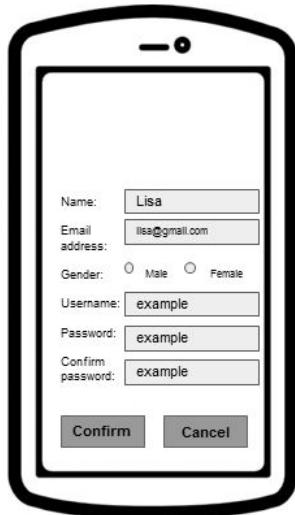




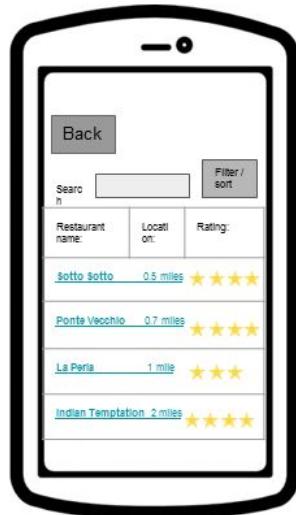
## Gastroview: Submitted Reviews



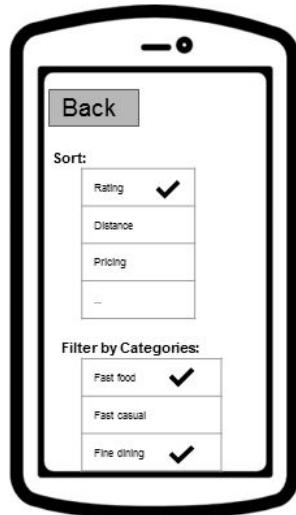
## Gastroview: Edit Information



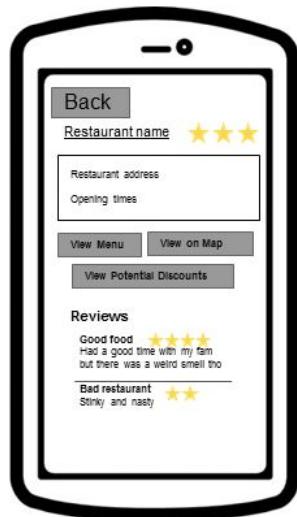
## Gastroview: Restaurant browser



## Gastroview: Restaurant filter / sort



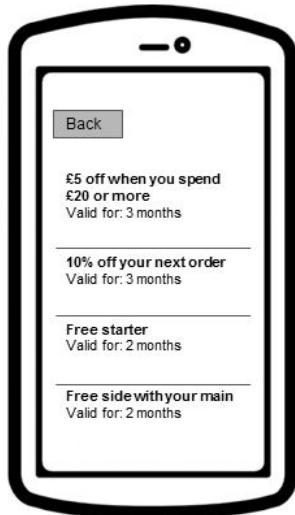
## Gastroview: Restaurant viewer



## Gastroview: Restaurant viewer (Map)



## Gastroview: Potential Discounts



## Gastroview: Menu



## Gastroview: Custom Requests



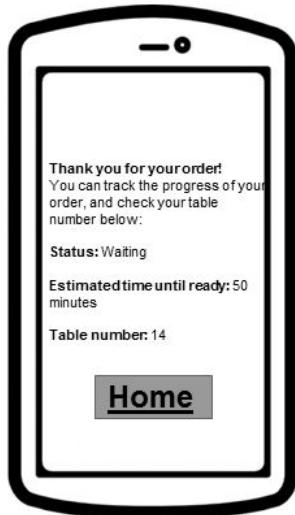
## Gastroview: Applying Discounts



## Gastroview: Payment



## Gastroview: Track Order



#### APPENDIX O: CUSTOMER APPLICATION HIGH FIDELITY PROTOTYPES

**The high fidelity customer-end prototype distributed among users can be viewed here:**  
<https://marvelapp.com/2b33c2i/>

Made using the POP by Marvel prototyping application, the high-fidelity prototype is fully interactive and focused on the customer end user group. While our low-fidelity prototypes were mainly used to help organise the basic layout of the app, with our medium fidelity prototypes offering general navigation of the planned application, the high-fidelity prototypes more closely resemble the finished product and offers navigation and other interaction closer to that which is expected to be offered in the final product, allowing us to gauge users' reactions to using the app and focus on areas of improvement which are more complex than just general navigation. However, this method still has some drawbacks compared to earlier prototyping stages. The main issue is that high-fidelity prototypes are much more time consuming to create. Each screen has to be designed according to the feedback gained in earlier stages, as well as requiring an extra level of detail to ensure it looks like a working product. High-fidelity prototypes are therefore only effective when used in conjunction with earlier, low-fidelity iterations, to ensure most requirements have been generated before committing to a final design.

Although the POP app allows prototypes to be fully interactive and resemble a working product, it has limited functionality in the sense that it cannot process any data and only accepts tap/click-based gestures, whereas many of the screens in the final product may rely on swiping and scrolling gestures which users are more familiar with.

The prototype was distributed via a link above to users, who were asked to display the prototypes using their mobile phone browsers so that interaction modes were most like the final application would be - a mobile-based application.



#### ORDER ON THE GO

Gastroview allows you to order and pay for your meal directly from your phone - perfect if you're in a rush.

#### FIND NEW RESTAURANTS

Discover new places to eat and drink nearby and see what other users think about them.

#### GET REWARDS

Receive incentives and discounts for letting other users know about your experience.



SIGN UP

LOG IN

SIGN UP

LOG IN

SIGN UP

LOG IN

The collage illustrates the Gastroview app's interface across four main screens:

- Login Screen:** Shows a blurred restaurant interior background with hanging lights. The title "Gastroview" is prominently displayed. Below it are fields for "USERNAME" and "PASSWORD", and a large red "LOG IN" button.
- Search and Filter Screen:** Displays a search bar with placeholder "Enter keywords...". Below it, users can refine their search by setting "Distance" (20km) and "Minimum Rating" (4 stars). A "Category" filter for "Italian" is selected. A "SEARCH" button is at the bottom, with a virtual keyboard overlay.
- Search Results Screen:** Shows a search for "Italian Restaurants in Bath with ★★★★☆". It displays two results: "Carluccio's" (2.1km away) and "Sotto Sotto" (2.0km away), each with a thumbnail, rating, and price range (£££).
- Restaurant Detail Screen:** Shows details for "Handmade Burger Co.". It includes a "Categories" section with "Italian" (with a thumbnail of a dish), "Mexican" (with a thumbnail of nachos), "Japanese" (with a thumbnail of sushi), and "Burgers" (with a thumbnail of a burger and fries). It also shows a "Description" (specialist burgers on sourdough or brioche buns), a "See Menu" link, a "Price Rating" (£££££), a "See Reviews (2)" link, and a "Location and Opening Times" section with a map.

**Reviews (2)**

**Handmade Burger Co.**

**Confirm Order**

The 'Reviews (2)' screen shows two reviews: 'Good Food' (4 stars) from 12/02/2017 and 'Not great!' (2 stars) from 10/02/2017.

The 'Handmade Burger Co.' screen displays a menu with categories: Starters, Mains, Sides, Drinks, Desserts. Under 'Starters', 'Chicken Wings' is selected at £4.90 x2. Other items include 'Dough Balls' at £3.50 x0 and 'Sweet Potato Fries' at £3.50 x0.

The 'Confirm Order' screen shows a summary: 'Your Order' includes 'Chicken Wings' (£4.90 x2). The total is £9.80. Payment options include PayPal and major credit cards (MasterCard, Maestro, VISA, Electron).

At the bottom of each screen is a navigation bar with icons for Favourites, Purchases, Discover (highlighted in red), Discounts, and Account.

**Close** Thank You!

Order No. 534-221

Your order is now being prepared.

**Estimated Delivery: 50-55 minutes.**

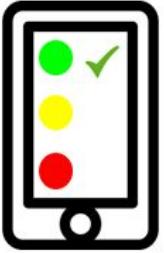
You can track it below, or later from the Purchases tab.

Track Order >

Submit a Review >

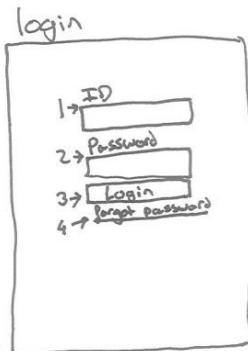
At the bottom is a navigation bar with icons for Favourites, Purchases, Discover (highlighted in red), Discounts, and Account.

## APPENDIX P: RESTAURANT APPLICATION STORYBOARD

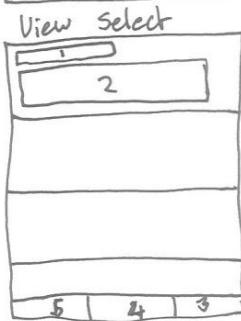
1. Login using restaurant ID and password.	2. View in Kitchen View.	3. Update order state.
<p>1. Login using restaurant ID and password.</p> 	<p>2. View in Kitchen View.</p> 	<p>3. Update order state.</p> 
4. Serve food.	5. View system in Waiter View.	6. Receive payment.
		

The restaurant side storyboard shows the stages the user goes through when using the restaurant side application to process an order and keep track of which stage the order is at. This shows the user the typical flow of events that takes place when using the restaurant side of the application. Firstly, the user will have to login to the application using the relevant ID and password. This will give them access to the application and allow them to view any current orders. They can then choose to go into either 'Kitchen View' or 'Waiter View'. In this case they are updating the order state so the user would choose to go into 'Kitchen View'. They would then select the correct order from the list and change the state appropriately. For example, the user may change the order state from 'Cooking' to 'Ready', indicating that it is ready to be served. Once the food has been served and the customers have eaten, the user can go into 'Waiter View' to check whether or not the order has been paid for yet. The user can then receive payment and close the order by changing the order state to 'Closed'.

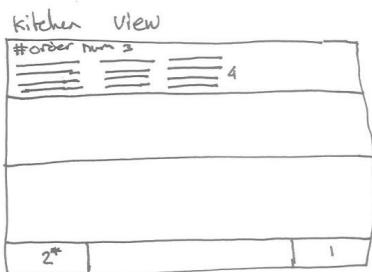
#### APPENDIX Q: RESTURANT APPLICATION LOW FIDELITY PROTOTYPES



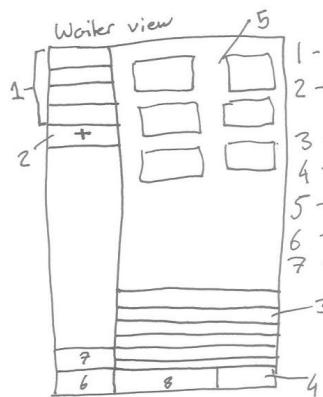
- 1 - Restaurant ID
- 2 - Restaurant Staff password  
or  
Admin password (to access admin settings)
- 3 - Login Button
- 4 - Link will give contact details of company to begin password recovery.  
Could also give admin contact details to get staff password.



- 1 - View Name (e.g. Kitchen, Waiter etc.)  
- Maybe custom depending on device  
(e.g. Kitchen tablet, Kitchen PC, Kitchen Multi-monitor)
- 2 - Description of view mode
- 3 - Exit (Close program)
- 4 - Logout (to login screen)
- 5 - Confirm selected View
- \* - Extra button in admin mode to access settings



- 1 - Exit view
- 2 - Order complete (Get Delete top or selected order from open orders)
- 3 - Unique reference number for order
- 4 - List of meals to prepare in order
- \* - After deletion, order goes to ready so waiter knows to collect order.



- 1 - List of Orders being handled by this waiter
- 2 - Adds another order/table  
- Will prompt online ID if customer ordered through the app
- 3 - List of items in current order
- 4 - Subtotal
- 5 - menu can be sorted into categories
- 6 - Exit button
- 7 - Waiter ID (e.g. Waiter 1)  
- Tapping this allows profile change  
(so may access another waiter's orders in the event a device breaks)
- 8 - Order State  
- Tap to select alternate state

- *The first sketch is for the login screen, this would be necessary to determine if the user is authorized to access the software and if they require access to admin settings.*
- *The second sketch is the view select, this allows the user to select a preferred view for the current device appropriate to its location and use. For example a tablet may need to be used by a waiter for collecting orders or by kitchen staff to keep track of orders.*
- *The third sketch outlines the general format of the kitchen view, it shows a list orders/menu items that need preparing, with controls to inform waiters of meals that are ready for serving.*
- *The waiter view includes tabs for each table/group of customers that particular waiter is serving, along with an order summary and menu to add items to the tab. It also allows waiters to quickly see what state a customer's meal is in (e.g. being prepared/ready to serve).*

#### APPENDIX R: RESTAURANT APPLICATION MEDIUM FIDELITY PROTOTYPES

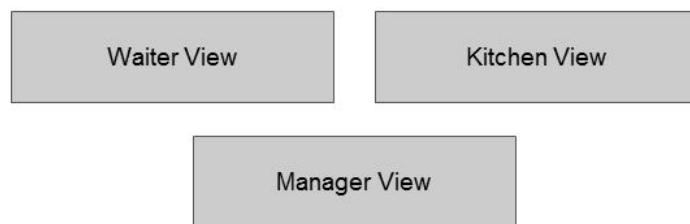
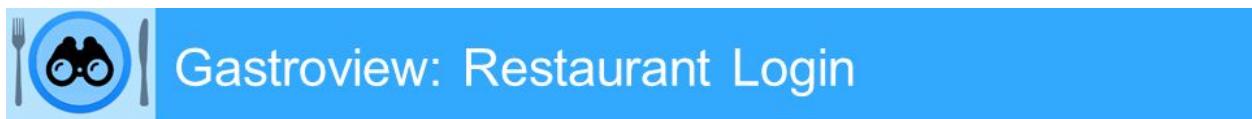
*Having constructed low-fidelity prototypes of the restaurant-end application which set out a vision for high-level design of the user interface, and having gone through various iterations and considered various alternatives for this low-fidelity design by making sure it conformed to our functional and nonfunctional requirements, we developed this interactive high fidelity prototype so that we could more easily present further iterations to end users, and move quickly towards a functional final prototype, and then the final product.*

*The form chosen to construct our initial medium fidelity prototype was a slideshow, with interaction provided by 'buttons' which allow navigation between the different slides. This will allow us to conduct empirical analysis and quickly iterate before moving to a different prototype media or the final functional product, as well as giving the users a good enough idea of what the final product will be like, as well as allowing us to implement changes suggested by the users and from our later-stage requirements gathering activities.*

*The restaurant employee from Appendix C was used to gather feedback on these prototypes.*

*To save space, white space will be cropped and only each prototype generation's changes will be shown.*

Figure Set 1 - First Generation Prototype:



Kitchen View

Log Out

Order #	Table #	Items Ordered	Status	
66	12	Cheeseburger -Pickles -Sauce, Fries Sma...	New	
67	12	Steak Medium Rare, Roast Potatoes, Pea...	Cooking	
70	10	Cheeseburger -Sauce, Fries Medium	Cooking	
71	13	Roast Chicken -Gravy, Roast Potatoes, C...	New	
73	15	Roast Lamb, Baked Potato +Beans +Che...	Cooking	
74	17	Beef Steak Well Done, Peas, Roast Potat...	Cooking	
77	9	Nacho's Sharing Platter Large +Dip	New	
78	2	Number 9 Large, Number 6 +Dip, Number...	Cooking	
80	7	Bacon & Cheese Topped Chicken -Chees...	New	
81	8	Veggie Burger +Cheese - Pickles, Fries S...	New	
83	3	Gammon Steak, Fries Large, Carrots	New	

Viewing Order #66

Return to Orders

Order Number:	66
Table Number:	12
Customer ID:	EmpSheev82
Order Status:	New
Food Items:	Cheeseburger -Pickles -Sauce Fries Small Fruit Salad Small Sticky Toffee Pudding

## Waiter View

Search...

Show Past Orders?

Order #	Table #	Items Ordered	Status		
66	12	Cheeseburger -Pickles -Sauce, Fries Sma...	New	<input type="button" value="View"/>	<input type="button" value="Paid?"/>
67	12	Steak Medium Rare, Roast Potatoes, Pea...	Cooking	<input type="button" value="View"/>	<input type="button" value="Paid?"/>
70	10	Cheeseburger -Sauce, Fries Medium	Cooking	<input type="button" value="View"/>	<input type="button" value="Paid?"/>
71	13	Roast Chicken -Gravy, Roast Potatoes, C...	New	<input type="button" value="View"/>	<input type="button" value="Paid?"/>
72	14	Rack of BBQ Ribs, Fries Large	Complete	<input type="button" value="View"/>	<input type="button" value="Paid"/>
73	15	Roast Lamb, Baked Potato +Beans +Che...	Cooking	<input type="button" value="View"/>	<input type="button" value="Paid?"/>
74	17	Steak Well Done, Peas, Roast Potatoes	Cooking	<input type="button" value="View"/>	<input type="button" value="Paid?"/>
77	9	Nacho's Sharing Platter Large +Dip	New	<input type="button" value="View"/>	<input type="button" value="Paid?"/>
78	2	Number 9 Large, Number 6 +Dip, Number...	Cooking	<input type="button" value="View"/>	<input type="button" value="Paid?"/>

## Manager View

Log Out

Restaurant Profile

Restaurant Name:	The Bath Burgerhouse
Restaurant ID:	BathBurgers
Password:	
Confirm Password	
Address Line 1:	12 Cheap Street
Address Line 2:	
City:	Bath
County:	Somerset
Post Code:	BA1 1NE
Opening Hours:	Open: 9:00  Close: 22:00



## Menu

Add... Return

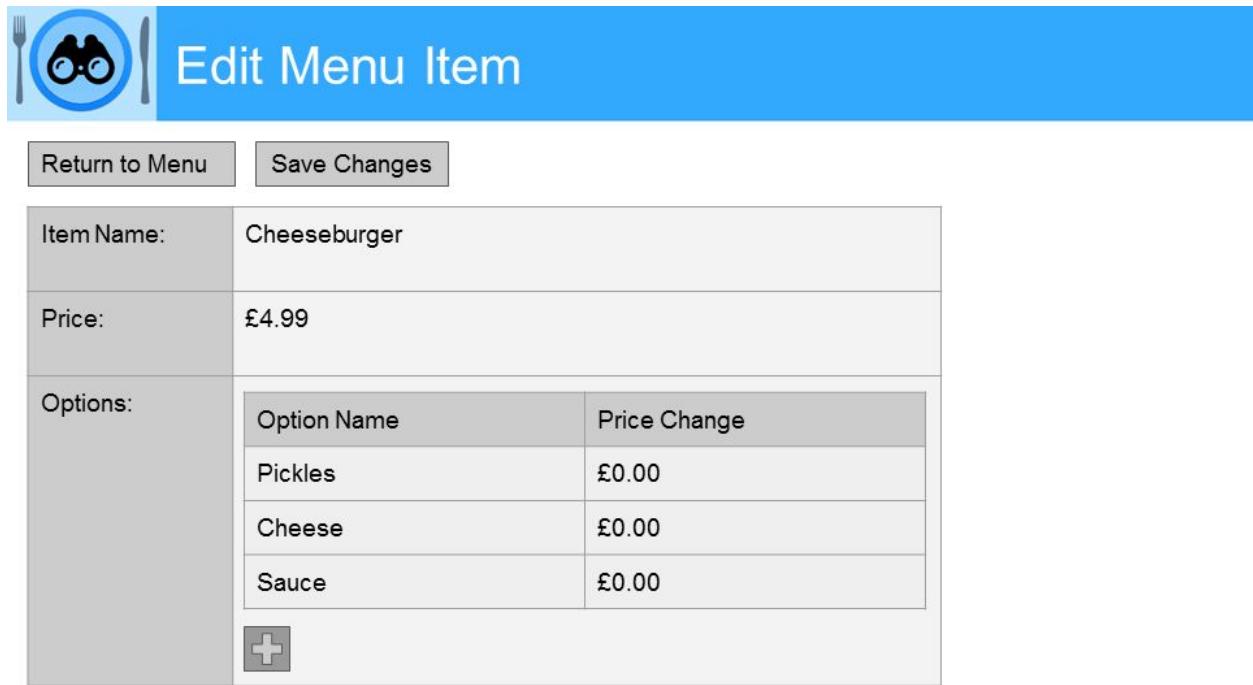
Item ID	Item Name	Price	Options		
01	Cheeseburger	£4.99	Pickles, Sauce, Cheese	<a href="#">Edit</a>	<a href="#">Remove</a>
02	Bacon Burger	£5.99	Pickles, Sauce, Cheese	<a href="#">Edit</a>	<a href="#">Remove</a>
03	Beef Steak	£6.99	Gravy	<a href="#">Edit</a>	<a href="#">Remove</a>
04	Lamb Chop	£6.99	Gravy	<a href="#">Edit</a>	<a href="#">Remove</a>
05	Fries	£1.99		<a href="#">Edit</a>	<a href="#">Remove</a>
06	Gammon Steak	£6.99		<a href="#">Edit</a>	<a href="#">Remove</a>
07	Peas	£1.00		<a href="#">Edit</a>	<a href="#">Remove</a>
08	Carrots	£1.00		<a href="#">Edit</a>	<a href="#">Remove</a>
09	Fruit Salad	£2.99	Apple, Grapes, B...	<a href="#">Edit</a>	<a href="#">Remove</a>
10	Roast Chicken	£6.99	Gravy	<a href="#">Edit</a>	<a href="#">Remove</a>



## Add Menu Item

[Return to Menu](#) [Save & Add](#)

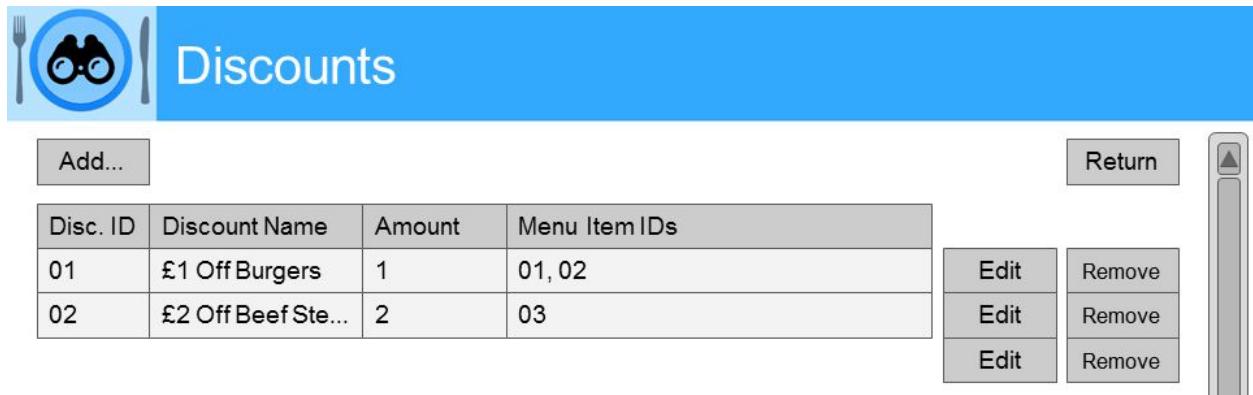
Item Name:		
Price:		
Options:	Option Name	Price Change
	<a href="#"></a>	



## Edit Menu Item

[Return to Menu](#) [Save Changes](#)

Item Name:	Cheeseburger	
Price:	£4.99	
Options:	Option Name	Price Change
	Pickles	£0.00
	Cheese	£0.00
	Sauce	£0.00
	<a href="#"></a>	



## Discounts

[Add...](#) [Return](#)

Disc. ID	Discount Name	Amount	Menu Item IDs
01	£1 Off Burgers	1	01, 02
02	£2 Off Beef Ste...	2	03

[Edit](#) [Remove](#)  
[Edit](#) [Remove](#)  
[Edit](#) [Remove](#)



## Add Discount

[Return to Menu](#) [Save & Add](#)

Discount Name:			
Amount			
Applicable Menu Item IDs:	<table border="1"><tr><td>Item ID</td></tr><tr><td>+ <input type="button"/></td></tr></table>	Item ID	+ <input type="button"/>
Item ID			
+ <input type="button"/>			



## Edit Discount

[Return to Menu](#) [Save Changes](#)

Discount Name:	£1 Off Burgers				
Amount	1				
Applicable Menu Item IDs:	<table border="1"><tr><td>Item ID</td></tr><tr><td>01</td></tr><tr><td>02</td></tr><tr><td>+ <input type="button"/></td></tr></table>	Item ID	01	02	+ <input type="button"/>
Item ID					
01					
02					
+ <input type="button"/>					

Figure Set 2 - Second Generation Prototype:

*In this prototype, extra information was added to the 'view order' screen, menu item 'types' were implemented, as were percentage/flats price discount.*

Return to Orders	
Order Number:	66
Table Number:	12
Customer ID:	EmpSheev82
Order Time:	18:32 (0 Hours 5 Minutes Ago)
Order Status:	New
Food Items:	Cheeseburger -Pickles -Sauce Fries Small Fruit Salad Small Sticky Toffee Pudding
Comment:	Please don't toast the bun.

Item ID	Item Name	Price	Types	Options		
01	Cheeseburger	£4.99	Large, Medium, S...	Pickles, Sauce, C...	Edit	Remove
02	Bacon Burger	£5.99	Large, Medium, S...	Pickles, Sauce, C...	Edit	Remove
03	Beef Steak	£6.99	Blue, Rare, Medi...	Gravy	Edit	Remove
04	Lamb Chop	£6.99		Gravy	Edit	Remove
05	Fries	£1.99	Large, Medium, S...		Edit	Remove
06	Gammon Steak	£6.99			Edit	Remove
07	Peas	£1.00			Edit	Remove
08	Carrots	£1.00			Edit	Remove
09	Fruit Salad	£2.99		Apple, Grapes, B...	Edit	Remove
10	Roast Chicken	£6.99	Leg, Breast, Mix	Gravy	Edit	Remove



## Add Menu Item

[Return to Menu](#)[Save & Add](#)

Item Name:		
Price:		
Types:	Type Name	Price Change
Options:	Option Name	Price Change



## Edit Menu Item

[Return to Menu](#)[Save Changes](#)

Item Name:	Cheeseburger	
Price:	£4.99	
Types:	Option Name	Price Change
	Large	£1.00
	Medium	£0.00
	Small	-£0.50
Options:	Option Name	Price Change



## Discounts

Add... Return

Disc. ID	Discount Name	Type	Amount	Menu Item IDs
01	10% Off Burgers	Perc.	10	01, 02
02	£2 Off Beef Ste...	Flat	2	03
03	Free Fries	Perc.	100	05

Edit Remove

Edit Remove

Edit Remove



## Add Discount

Return to Menu Save & Add

Discount Name:		
Type:	Percentage <input type="radio"/>	Flat Amount <input checked="" type="radio"/>
Amount		
Applicable Menu Item IDs:	Item ID	<span style="border: 1px solid #ccc; padding: 2px; width: 20px; height: 20px;"></span>



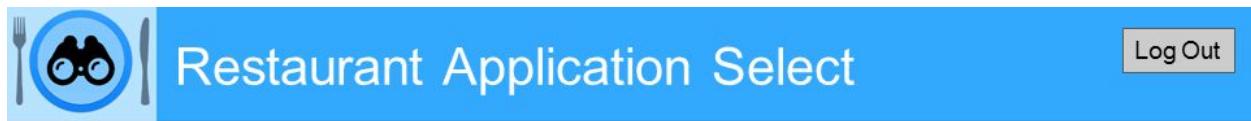
## Edit Discount

Return to Menu Save Changes

Discount Name:	10% Off Burgers	
Type:	Percentage <input checked="" type="radio"/>	Flat Amount <input type="radio"/>
Amount	10	
Applicable Menu Item IDs:	Item ID	<span style="border: 1px solid #ccc; padding: 2px; width: 20px; height: 20px;"></span>
	01	<span style="border: 1px solid #ccc; padding: 2px; width: 20px; height: 20px;"></span>
	02	<span style="border: 1px solid #ccc; padding: 2px; width: 20px; height: 20px;"></span>
	<span style="border: 1px solid #ccc; padding: 2px; width: 20px; height: 20px;"></span>	

Figure Set 3 - Third Generation Prototype:

Our final medium-fidelity prototype incorporated user feedback by implementing a table management interface, available to all users of the restaurant-end application.



The screenshot shows a blue header bar with the text "Table Manager". On the left is a logo consisting of a fork and knife crossed with a magnifying glass icon. Below the header is a "Return to Menu" button. The main area contains a table with the following data:

Table #	Location	Occupied?	
01	Main Hall Left	<input checked="" type="checkbox"/> Occupied	
02	Main Hall Left	<input checked="" type="checkbox"/> Occupied	
03	Main Hall Right	<input checked="" type="checkbox"/> Occupied	
04	Main Hall Right	<input checked="" type="checkbox"/> Free	
05	Front Right Booths	<input checked="" type="checkbox"/> Occupied	
06	Back Right Booths	<input checked="" type="checkbox"/> Occupied	
07	Front Left Booths	<input checked="" type="checkbox"/> Free	
08	Back Left Booths	<input checked="" type="checkbox"/> Free	

On the right side of the table, there are two vertical columns of buttons: "Add Table" and "Remove" for each table entry. A vertical scroll bar is located on the far right of the table area.

#### APPENDIX S: COGNITIVE WALKTHROUGH DATA COLLECTION

Main tasks were broken down into subtasks for the user to carry out. Observations were made as the user gave feedback on their interaction experience with the system.

**Throughout the CW, 4 questions were kept in mind (Blackmon, Polson, et al., 2002):**

- *Will the user try and achieve the right outcome?*
- *Will the user notice that the correct action is available to them?*
- *Will the user associate the correct action with the outcome they expect to achieve?*
- *If the correct action is performed; will the user see that progress is being made towards their intended outcome?*

Activity 1: Signing Up for a New Account (Entry: Tutorial Screen)

Step #	Description	Exemplar Method	Observations & User Feedback
1	<b>Navigate to the ‘Signup’ page.</b>	Press the “Sign Up” button.	User had no trouble finding and pressing the button, taking them to the intended page, after shortly taking time to read the three tutorial pages. They commented positively on the ‘clean layout’ of the entry page(s).
2.1	<b>Enter details for a new account.</b>	Enter username, password and confirm password into appropriate fields.	User correctly identified which information to enter into each textbox.
2.2	<b>Register your account.</b>	Press “Sign Up” button.	User naturally pressed the “Sign Up” button after having filled out the fields correctly.

**Notes:** Throughout this task, the user was able to identify the correct action to take at each step easily and took said actions to achieve the set goal of registering a new user account with the Gastroview system. The user was able to associate the completion of each step with progress being made towards the goal since each step either explicitly gathered information from them or navigation to a screen more closely related to the goal than the previous.

Activity 2: Logging Into an Existing Account (Entry: Tutorial Screen)

Step #	Description	Exemplar Method	Observations & User Feedback
1	<b>Navigate to “Login” page.</b>	Press the “Login” button.	User recognised the entry screen from the previous test, almost immediately clicked the correct button.

<b>2.1</b>	<b>Enter the details for the account you just created.</b>	Enter username, and password into appropriate fields.	User recalled the information that they entered during Activity 1 and entered it correctly here.
<b>2.2</b>	<b>Log into your account.</b>	Press “Log In” button.	User naturally pressed the “Login” button after having filled out the fields. Took two attempts, user incorrectly entered password on first attempt, commented on how the dialog box used to tell them that they hadn’t been logged in ‘stuck out’ from the rest of the application they’d seen.

**Notes:** Throughout this task, the user was able to identify the correct action to take at each step easily, with each step being swiftly completed after the method was identified. The only error made was due to failings in the user’s own memory/typing ability, where the user forgot the password they had just used to create an account. The user was able to associate the completion of each step with progress being made towards the goal since each step either explicitly gathered information from them or navigation to a screen more closely related to the goal than the previous. The user commented that the change of colour scheme from white and red on the tutorial screen to black and red on the login and registration screens (the latter referring to activity one) was quite stark, though not necessarily unpleasant, but that it did feel ‘a bit unnatural’. A suggested improvement was adding some white background to the login and registration screens to make the change of colour screens when navigating between them less jarring. A similar complaint was made regarding the generic dialog box used to indicate that the user had intended to login using invalid credentials - switching to using an in-app.

Activity 3: Browse for a Specific Restaurant with Given Name “Sotto Sotto” and find out its Star Rating.  
(Entry: Restaurant Browser (Discover) Screen)

Step #	Description	Exemplar Method	Observations & User Feedback
<b>1</b>	<b>Search for a restaurant called “Sotto Sotto”.</b>	Enter “Sotto Sotto” into the top search bar on the search page, then press the “search” button.	User entered the restaurant name into the search box, looked at the other search options on the search refinement screen and, after deciding that they weren’t needed, pressed the search button.
<b>2</b>	<b>Identify Correct Restaurant Search Result</b>	Glance over the results to find the correct restaurant.	Correct restaurant result was the only result, user found it immediately.

<b>3</b>	<b>Find its Star Rating</b>	The user can either find the star rating directly from the result listing, or can navigate to the restaurant's information page by clicking on the result listing and read it from there.	User read the star rating correctly directly from the result listing.
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**Notes:** This task was completed by our user without issue, with the user correctly identifying the action to perform at each stage. Of particular note was the user's ability to easily separate the search features they needed to use from those that were irrelevant to the task. Of the two methods the user could have used to complete the task, they opted for the simplest one - reading the star rating directly from the search results instead of navigating through to the restaurant's information screen, suggesting that the data displayed on this screen, while being more compact than on the full restaurant information screen, is still clear enough to be understandable. The steps for this activity clearly moved the user further towards their goal, since responses to the user's queries are clearly displayed after it has been entered.

**Activity 4: Place an Order at Burger King for an Extra Large Bacon Cheeseburger with No Cheese with Medium Fries. (Entry: Restaurant Browser Screen)**

<b>Step #</b>	<b>Description</b>	<b>Exemplar Method</b>	<b>Observations &amp; User Feedback</b>
<b>1</b>	<b>Search for a restaurant called "Sotto Sotto".</b>	Enter "Burger King" into the top search bar on the search page, then press the "search" button.	User entered the restaurant name into the search box and pressed the search button.
<b>2</b>	<b>Identify Correct Restaurant Search Result</b>	Glance over the results to find the correct restaurant.	Correct restaurant was the only result, user found it immediately.
<b>3</b>	<b>Navigate to Restaurant's Information Page.</b>	Click on the restaurant's search result listing.	The restaurant result listing itself did not immediately appear clickable to the user, they were expecting an 'order button' to appear on the search results page to let them order directly from the restaurant. After some experimentation they did click on the listing.
<b>4</b>	<b>Navigate to the Menu Screen.</b>	Click on the "See Menu" Button.	The user looked over all of the available options and did correctly click on the "See Menu" button, but did comment that it would have made sense

			to have included “order” on the button somewhere.
5	<b>Customise the order so that it contains an extra large bacon cheeseburger with no cheese and medium fries.</b>	Change bacon cheeseburger type to “extra large”, check the “no cheese” checkbox, and increase the amount to one. Change fries type to “medium”, and increase the amount to one.	The user managed to perform this task well, commenting that the layout of the menu items made sense, but did raise a potential issue regarding a situation where a user might want to order, for instance, a large fries and a small fries - this is not currently possible in our application.
6	<b>Place Order.</b>	Press the “Order” Button.	User naturally pressed the “Order” button after having customised their order.

**Notes:** The start of this task required our user to search for a restaurant by the name of “Burger King”, an activity exactly the same as Activity 3, so it was completed without issue, since the user already had experience of completing the task of searching for a restaurant. An issue was identified when the user tried to navigate from the search results page to the restaurant information page - they were not immediately sure whether or not the listing itself was clickable or not, but after experimenting they were able to take the required action to move on. This could be rectified by making some of the text on result listings fit the convention of clickable text, i.e. being underlined and in a noticeably different colour, to look like a hyperlink. Once past this, the user was able to easily navigate to the restaurant menu screen and place their order, although a suggestion was made to change the “see menu” option on the restaurant info screen to something that more clearly entails the ability to place an order.

A shortcoming in our order placement screen was also identified; at present, the user can only select one ‘type’, e.g. small, medium or large fries,) for each menu item, but there is no way of, for instance, ordering small fries and large fries.

#### Activity 5: Browse Existing Reviews for restaurant “Handmade Burgers Co. Bath” (Entry: Restaurant Browser (Discover) Screen)

Step #	Description	Exemplar Method	Observations & User Feedback
1	<b>Search for a restaurant called “Handmade Burgers Co. Bath”.</b>	Enter “Handmade Burgers” into the top search bar on the search page, then press the “search” button.	User entered the restaurant name into the search box and pressed the search button.
2	<b>Identify Correct Restaurant Search Result</b>	Glance over the results to find the correct restaurant.	Correct restaurant was the only result, user found it immediately.

3	<b>Navigate to Restaurant's Information Page.</b>	Click on the restaurant's search result listing.	Restaurant result listing itself did not immediately appear to be the correct place to click for the user, they were expecting a 'see reviews' link under each search result to let them browse reviews directly from here. After some experimentation they did click on the listing.
4	<b>Navigate to the See Reviews screen.</b>	Click on the "See Reviews" Button.	The user looked over all of the available options and did correctly click on the "See Reviews" button, but did comment that it would have made sense to have included "see reviews" under each search result.
5	<b>Find Reviews (Should they exist)</b>	Scroll through results.	The user correctly managed to scroll up and down the screen to observe existing reviews, commenting in particular that they liked how similarly modelled the reviews were to existing companies' reviews pages - eBay, Amazon, TripAdvisor and so on, so it was easy to gage a general consensus of opinion on a particular restaurant.

**Notes:** This task was completed by our user without issue, with the user correctly identifying the action to perform at each stage. The start of this task required our user to search for a restaurant by the name of "Handmade Burgers", an activity exactly the same as Activity 3 and 4, so it was completed without issue, since the user already had experience of completing the task of searching for a restaurant. Of particular note was the fact that the user expected to see some sort of "see reviews" link underneath each search result. On reflection, this could be seen as a more intuitive (shorter) avenue to viewing restaurant-specific reviews.

A feature that the user seemed appreciative of was the fact that the system adopts a common star-rating model, meaning new users of any background are likely to understand the meaning behind what the number of stars corresponds to, without having to clarify for further information, or even necessarily read reviews in full - the overall opinion of a reviewer could be quickly summarized.

#### Activity 6: Leave a Review for restaurant (Entry: Order Confirmation Screen)

Step #	Description	Exemplar Method	Observations & User Feedback

<b>1</b>	<b>Navigate to the Submit Review screen.</b>	Click on the “Submit a Review” Button.	User pressed the correct “Submit a Review” button.
<b>2</b>	<b>Enter title for review.</b>	Click on the textbox with hint “Title”. A keyboard will appear to type. Use the keyboard to type and click “Done” to remove the keyboard from sight.	User clicked on the text box, typing in their review title and clicking on the “done” button to remove the keyboard from sight.
<b>3</b>	<b>Enter review message.</b>	Click on the textbox with hint “Review”. A keyboard will appear to type. Use the keyboard to type and click “Done” to remove the keyboard from sight.	User clicked on the text box, typing in their review message and clicking on the “done” button to remove the keyboard from sight.
<b>4</b>	<b>Select star rating.</b>	Click on one of the faded stars corresponding to an out-of-5 star rating.	The user did initially have difficulty realising that the stars needed clicking in order to select a rating. They noted that it would be easier for the user if a message instructing them how to do so could appear on the screen the first time they left a review to avoid confusion and avoid patronising the user in the future if a message appeared every time a review was posted.
<b>5</b>	<b>Submit review.</b>	Click on the “Submit Review” button.	The user correctly clicked on the “Submit Review” button once their review had been typed.

**Notes:** This task was largely completed by our user without issue, with the user correctly identifying the action to perform at each stage. Of particular note was the difficulty encountered when trying to select a rating.

One possible shortcoming of our application was identified. Upon probing them on their comments, the user suggested that the first time a user completes an action (for example submitting a review or placing an order) a tutorial screen pops up with helpful instructions for a user. They can hide this tutorial and never see it again if they wish, or hide it once. This would avoid users being patronised by repeated help even when they are fully used to using the system.

## Activity 7: Find Italian Restaurants rated 4 stars or above within 10km (Entry: Restaurant Browser Screen)

<b>Step #</b>	<b>Description</b>	<b>Exemplar Method</b>	<b>Observations &amp; User Feedback</b>
1	<b>Start a search.</b>	Tap on the search bar textbox at the top of the page.	The user clicked on the search bar at the top of the page to bring up the 'discover' search filtering screen.
2	<b>Select distance filter.</b>	Drag slider back and forth as appropriate until number displayed = 10km.	The user dragged the slider back and forth a few times to get used to what impact each direction had on the distance value chosen. They commented that it would be useful to have labels at each end of the slider to indicate which direction corresponded to 'nearby' and which corresponded to 'afar'.
3	<b>Select minimum rating.</b>	Click on one of the faded stars corresponding to an out-of-5 star rating.	Similar to Activity 6, it was not immediately obvious to the user that they needed to click on a star for it to 'fill in' in red. A tutorial pop up would have been helpful here.
4	<b>Select a category.</b>	Click on the category tab. Select Italian from the resulting pop up list.	The user clicked the "Category" button and clicked on "Italian" from the resulting menu.
5	<b>Choose whether to use current location in search.</b>	Click on the toggle bar next to "Use Current Location". On = green. Off = grey.	The user toggled "Use Current Location" to be green, realising this was necessary for the distance feature to work effectively.
6	<b>Execute search.</b>	Click on the "Search" button and view list of resulting restaurants..	Once all fields were filled out, the user verified them one by one before clicking the "Search" button.

**Notes:** This task was completed by our user without issue, with the user correctly identifying the action to perform at each stage. This was mainly due to having a good experience with the search feature of the restaurant browser from Activity 3, Activity 4 and Activity 5.

Again, the shortcoming of a tutorial feature was prevalent here. The user commented that they would like more information on how dragging the slider adjusts the distance value and how to choose a

star rating. This screen was perfectly usable and had a good level of user interaction in their opinion, but they desired an accompanying tutorial pop up that could be dismissed by the user when they were confident.

#### APPENDIX T: TASK BASED EVALUATION DATA COLLECTION

According to Preece et al. (2015), the process of qualitative analysis can be broken down into three steps: identifying patterns and themes in gathered data, categorising data, and analysing critical aspects. These stages are not mutually exclusive, meaning they can be carried out in conjunction where appropriate. This allowed potential areas of improvement within our system to arise naturally, including issues that we had perhaps not considered earlier.

The ‘Think Aloud Protocol’ is the main method utilised here for gathering qualitative data. This is a technique formalised by Lewis and Rieman (1993), involving an observer asking participants to complete a specified task using the system. The user interface and purpose of the system are briefly explained to the user, as well as the goals of the session - observers are interested in testing the effectiveness of the user interface, *not* their personal ability. Users are expected to say out loud anything they may be thinking while performing their task. This could simply mean explaining the actions they are taking and their reasoning behind them, but more valuable feedback will also incorporate the user’s thoughts and feelings towards the system. For example, the user may correctly perform all of the expected actions, but they may still express frustration at the layout of the system when thinking aloud.

One of the key advantages of this protocol is that it is very easy to perform in terms of resources required and time constraints. It provides reliable, unbiased results, providing the study is conducted in a proper manner and user prompts are used sparingly. However, there are some downsides to this technique: from a psychological point of view, some users may find the act of describing everything they are doing somewhat off putting. The observer may need to issue multiple prompts in order to get the user to provide the ‘stream of consciousness’ required for valuable results. As stated previously, it is important not to give too much guidance to the user to ensure results are as reliable as possible.

These task tables are based on the format suggested by Trulock (2008).

This study was carried out on a sample of 10 users, mainly students from the University of Bath with previous experience in using mobile applications. Each user’s observations were recorded in the form of transcripts, and the time taken to complete each task was also recorded.

#### Activity 1: Create an Account (Entry: Tutorial Slider Screen)

<b>Task No.</b>	1	<b>Title</b>	Create Account
<b>Goal</b>		By the end of this task, the user will have created a new account on the system and logged into it.	
<b>Inputs</b>		Full Name, Valid E-mail Address, Password	
<b>Prerequisites</b>		N/A	
<b>Steps</b>		<ul style="list-style-type: none"> <li>• Tap ‘sign up’ button             <ul style="list-style-type: none"> <li>◦ or tap ‘log in’ button, then ‘sign up’ button.</li> </ul> </li> </ul>	

	<ul style="list-style-type: none"> <li>• Fill out required inputs</li> <li>• Tap 'submit' button</li> <li>• User should recognise that they have logged in when they are presented with the application's 'Discover' screen.</li> </ul>
<b>Instructions for User</b>	Start by creating a new account and signing into the system. You may use the personal details we have provided, or your own.
<b>Time Taken for Expert to Complete</b>	~30 seconds
<b>Notes</b>	Our application displays a swipeable splash screen when the user is not logged in, detailing the main features of the system. This is considered separate from the login system and therefore the user's interaction with it won't be considered during this task.

#### Activity 2: View Saved Discounts (Entry: Discover Screen)

<b>Task No.</b>	2	<b>Title</b>	View Saved Discounts
<b>Goal</b>	By the end of this task, the user will have navigated to their available discounts and described these to the expert.		
<b>Inputs</b>	N/A		
<b>Prerequisites</b>	<p>The user will be logged into an account with 3 preloaded discounts:</p> <ol style="list-style-type: none"> <li>1. <i>20% off at Prezzo Bath</i></li> <li>2. <i>2 for 1 main course at Pizza Express Bath</i></li> <li>3. <i>£2 credit at any participating restaurant in Bath or Bristol.</i></li> </ol>		
<b>Steps</b>	<ul style="list-style-type: none"> <li>• Tap the 'Discounts' tab at the bottom</li> <li>• Read the discounts aloud</li> </ul>		
<b>Instructions for User</b>	You have been logged into a user's account which already has some discounts collected for future use. I would like you to tell me which discounts have been collected and the locations where they are valid.		
<b>Time Taken for Expert to Complete</b>	~5 seconds		
<b>Notes</b>	The main aim of this task is to determine whether our tab system is clearly organised. Currently, 'Discounts' is one of five main tabs, as we feel this is a section which users will use frequently and require quick access to.		

## Activity 3: Find Nearby Restaurants using Filters (Entry: Discounts Screen)

<b>Task No.</b>	3	<b>Title</b>	Find Nearby Restaurant using Filters
<b>Goal</b>	By the end of this task, the user will have used the filtering system to find the nearest restaurant to the user under the 'Burgers' category. They will have demonstrated this by viewing the location of the restaurant on the map.		
<b>Inputs</b>	N/A		
<b>Prerequisites</b>	The user will be logged into an account with the device's Location Services turned on.		
<b>Steps</b>	<ul style="list-style-type: none"> <li>• Navigate to main 'Discover' screen.</li> <li>• Tap the Search bar</li> <li>• Tap 'Categories'</li> <li>• Select 'Burgers' category</li> <li>• Optionally filter the restaurants to a certain distance</li> <li>• Press 'Search' button</li> <li>• Press 'Sort by...' button</li> <li>• Sort by distance</li> <li>• Tap the restaurant which appears at the top of the list</li> <li>• Scroll down to the Map view</li> <li>• View the restaurant's location on the map.</li> </ul>		
<b>Instructions for User</b>	I would like you to find a nearby restaurant. Search for the closest restaurant to your location which specialises in burgers. Once you have found it, show me where the restaurant is located on a map.		
<b>Time Taken for Expert to Complete</b>	~27 seconds		
<b>Notes</b>	The main aim of this task is to determine whether the filtering and sorting feature is clear to the user. The user should also be aware without prompts that map functionality is built into the application, so they will not need to use an external app for this.		

## Activity 4: View Restaurant-Specific Discounts (Entry: Discover Screen)

<b>Task No.</b>	4	<b>Title</b>	View Restaurant-Specific Discounts
<b>Goal</b>	By the end of this task, the user will have used the search feature (this time using keywords) to locate a particular restaurant page. The user will be able to describe the discounts offered by the restaurant to the		

	expert.
<b>Inputs</b>	Restaurant Name
<b>Prerequisites</b>	The user will be logged into an account. The database will contain several restaurants which match the same keyword, to see if the user can identify the correct one using the interface. The restaurant will have one discount offered: <i>50% off all Desserts</i> .
<b>Steps</b>	<ul style="list-style-type: none"> <li>• Tap the Search bar</li> <li>• Type the specified Restaurant Name</li> <li>• Tap the desired restaurant on the list</li> <li>• Tap the 'Available Discounts' section</li> <li>• Read the discount aloud</li> </ul>
<b>Instructions for User</b>	I would like you to tell me which discounts are offered by the restaurant 'Burger King'.
<b>Time Taken for Expert to Complete</b>	~20 seconds
<b>Notes</b>	N/A

#### Activity 5: View Specific Restaurant Reviews (Entry: Discover Screen)

Task No.	5	Title	Viewing Reviews
<b>Goal</b>	By the end of this task, the user will have searched for a particular restaurant and browsed its submitted reviews.		
<b>Inputs</b>	Restaurant Name		
<b>Prerequisites</b>	The user will be logged into an account. The restaurant will be populated with 3 reviews: two 5 Star ratings and one 2 Star rating.		
<b>Steps</b>	<ul style="list-style-type: none"> <li>• Tap the Search bar</li> <li>• Type the specified Restaurant Name</li> <li>• Tap the desired restaurant on the list</li> <li>• Tap 'See Reviews (3)'</li> <li>• Summarise the reviews aloud</li> </ul>		
<b>Instructions for User</b>	I would like you to tell me what other users thought about the restaurant 'Al Falafel'. How many reviews have been submitted for it and what are their ratings?		

<b>Time Taken for Expert to Complete</b>	~30 seconds
<b>Notes</b>	The review system is one of the key features of the system. The main aim of this task is to determine whether it is prominent enough in the User Interface to ensure that users are aware of its existence and can navigate to it quickly.

## Activity 6: Place an order (nonspecific) (Entry: Discover Screen)

<b>Task No.</b>	6	<b>Title</b>	Placing an Order - Nonspecific
<b>Goal</b>	By the end of this task, the user will have placed an order at a specified restaurant.		
<b>Inputs</b>	Restaurant Name, Dummy Debit Card information		
<b>Prerequisites</b>	The user will be logged into an account without any payment information entered. The specified restaurant should have a fully populated menu.		
<b>Steps</b>	<ul style="list-style-type: none"> <li>• Tap the Search bar</li> <li>• Type the specified Restaurant Name</li> <li>• Tap the desired restaurant on the list</li> <li>• Tap 'See Menu'</li> <li>• Add some items to the basket</li> <li>• Tap 'Checkout' bar at bottom of screen</li> <li>• Tap 'Pay by Card'</li> <li>• Fill out payment information</li> <li>• Save payment information</li> <li>• Tap 'Confirm Order'</li> </ul>		
<b>Instructions for User</b>	I would like you to place an order at 'Carluccio's'. It doesn't need to be anything in particular, just choose some items and then pay for it using the provided payment information.		
<b>Time Taken for Expert to Complete</b>	~1 minute, 15 seconds		
<b>Notes</b>	The aim of this task is to see if the ordering process is clear - finding the menu and paying for an order should both be clear and quick actions to perform.		

## Activity 7: Place an order (specific) (Entry: Discover Screen)

<b>Task No.</b>	7	<b>Title</b>	Placing an Order - Specific
<b>Goal</b>	By the end of this task, the user will have ordered 2 selected items from a specific restaurant.		
<b>Inputs</b>	Restaurant Name		
<b>Prerequisites</b>	The user will be using the same account as the previous task, so payment information will be saved. The specified restaurant should have a fully populated menu.		
<b>Steps</b>	<ul style="list-style-type: none"> <li>• Tap the Search bar</li> <li>• Type the specified Restaurant Name</li> <li>• Tap the desired restaurant on the list</li> <li>• Tap 'See Menu'</li> <li>• Add some items to the basket</li> <li>• Tap 'Checkout' bar at bottom of screen</li> <li>• Tap 'Pay by Card'</li> <li>• Fill out payment information</li> <li>• Save payment information</li> <li>• Tap 'Confirm Order'</li> </ul>		
<b>Instructions for User</b>	I would like you to find the restaurant called 'Wagamama' and order two main portions of Beef Ramen and one side order of Chilli Squid.		
<b>Time Taken for Expert to Complete</b>	~1 minute		
<b>Notes</b>	This follow up task continues to analyse the usability of the ordering process, but more specifically how easy it is to locate particular items. The items are currently categorised in terms of mains, sides, drinks etc. - is this the most effective method?		

## Activity 8: Submit a Review (Entry: Discover Screen)

<b>Task No.</b>	8	<b>Title</b>	Submitting a Review
<b>Goal</b>	By the end of this task, the user will have submitted a review for a restaurant they have visited previously.		
<b>Inputs</b>	Restaurant Name		
<b>Prerequisites</b>	The user will be using the same account as the previous task, so		

	previously visited restaurants will be saved.	
<b>Steps</b>	<ul style="list-style-type: none"> <li>• Tap the Search bar</li> <li>• Type the specified Restaurant Name</li> <li>• Tap the desired restaurant on the list</li> <li>• Tap 'See Reviews'</li> <li>• Tap 'New Review' button</li> <li>• Enter Title</li> <li>• Select Star Rating</li> <li>• Enter Review Text</li> <li>• Tap 'Submit'</li> </ul>	<i>or...</i> <ul style="list-style-type: none"> <li>• Tap 'Purchases' tab</li> <li>• Tap the order placed in the previous task</li> <li>• Tap the 'Submit a Review' button</li> <li>• Enter Title</li> <li>• Select Star Rating</li> <li>• Enter Review Text</li> <li>• Tap 'Submit'</li> </ul>
<b>Instructions for User</b>	I would like you to submit a review for the restaurant you just ordered from. You can say anything you like in the review.	
<b>Time Taken for Expert to Complete</b>	~50 seconds	
<b>Notes</b>	There are two possible ways to complete this task, with the intention of making writing a review easy to accomplish from anywhere in the app. However, we want to ensure that these two paths of interaction do not cause unnecessary confusion to the user.	

#### **APPENDIX U: THINK ALOUD STUDY - SAMPLE TRANSCRIPT**

*This sample transcript comes from the same user carrying out all 8 of the tasks outlined in Appendix T. The observer created these written notes documenting exactly what the user was saying aloud while carrying out the tasks. This same procedure was carried out on multiple users, but these full transcripts have been omitted here for the sake of brevity. Prompts from the observer are displayed in bold.*

#### **Task 1**

“So the first thing I’m seeing is a screen with a photograph and some text explaining what the app does. There’s a login and sign up button on the screen too. I can see some dot indicators on the screen which, from experience, usually means that this interface has multiple pages. I’m going to try swiping to go to the next page - it worked, now there’s a new photograph and text on the page. Looks like this is some kind of introduction to the app. I’ll press the sign up button, since that’s what I want to do. Now I’m taken to a new screen which has several text boxes to enter information. I’ll enter my name, email address and password. \*Waits for data entry\*. Ok, and now I’ll press the button which says ‘sign up’. I’m now on a new screen with a lot of restaurants on it, so I think it worked.”

**Prompt: How did that experience make you feel? Were you confused at any point?**

“Fine, it seemed similar to other apps so yeah, I didn’t really find it confusing, it was pretty straightforward.”

#### **Task 2**

“Ok, so there’s a bar at the bottom with a few different sections of the app. Right now I’m in the ‘Discover’ section but let’s see what the others are first. There’s ‘Favourites’ and ‘Purchases’... Purchases seemed like it might have been the place to go but I can also see a ‘Discounts’ section, so I’ll go there instead. Ok, that seemed quite easy to find - there are three discounts here which I think are the user’s saved ones. There’s 20 percent off at Prezzo, a voucher for 2 for 1 main courses at Pizza Express, and another one for £2 credit in Bath or Bristol. I’m not sure if that one corresponds to a particular restaurant.”

**Prompt: So do you think the saved discounts are laid out well?**

“Yeah, quite well - I didn’t really struggle to find them and I can’t really think of any other way you’d present them other than a list like you already have.”

#### **Task 3**

“I’m back in the ‘Discover’ section again which this time seems like the right place to be - I think that mainly because I can see a search icon. Since I want to find a specific restaurant, that would be the first place I’d go. There’s quite a lot going on on this screen, it’s quite busy - however, the search bar is very prominent so that’s good.”

**Prompt: How does the busy nature of the screen make you feel when using the app?**

“I don’t find it too distracting but I can see users who are less experienced with technology struggling a bit... They might feel a bit overwhelmed, you know? It seems like it could be quite useful when you aren’t looking for anything specific - to discover stuff, as the name would imply. So now I’m trying to find a way to search by location on the app but can’t really see one... There’s lists of featured restaurants and highly rated restaurants but none that show you nearby ones! This is slightly confusing... I’ll try tapping the search bar and see what happens. Ah, there’s some more options in

here! I thought the search bar could only be used for typing in words, I didn't realise more options were hidden behind it."

"So there's an option here for allowing my nearby location which is checked. I'll try narrowing down the search radius to about 3km as well so we get really nearby places. Looks like I can also pick a category... Oh, there's a long list and Burgers is right at the top! I like that each category has its own photograph so it's quite easy to spot them at a glance. I'll pick 'Burgers' since that's what we're trying to find. Now I've pressed the search button and a few options came up... Oh, now there's also an option to sort the results. I think the best way to find the nearest will be to sort by distance. Ok, so the top result is Burger King which is 0.3km away... Sounds about right so I'll click that. Right... this looks like a bit of information about the restaurant, and I can see a map on the screen already. And there's the restaurant's location!" \*Shows map to observer\*

#### **Task 4**

"Alright, so I'm looking for Burger King again to see what discounts they offer... I think I saw that option earlier when I was looking at the restaurant's information. I suppose I could find it again by looking for the nearest Burger restaurant again, but I think the best way would probably be to just search for the name. So I'll tap the search bar at the top again and... \*types in Burger King\*. There we go, then I'll click search - don't think I need any filters this time as the name itself should be good enough. Ok... So I've found the restaurant again and tapped it. There's the discounts option, so I'll click that... Alright, this list looks pretty much the same as last time - there's only one discount by the looks of things, which gives you 50 percent off desserts."

**Prompt: How did you find that? Easy or hard?**

"It was quite easy really - I knew how to use the search feature after the last task and I also saw the discounts section as well, so I knew where to go from there. Nothing too frustrating."

#### **Task 5**

"Right, so same as last time I'm going to go straight to the search bar and type in the name of the restaurant. \*Types in Al Falafel\*. There it is, so I'll tap on the restaurant. Ok, so now I'm back on the information screen. There's a section highlighted in red for the restaurant's reviews - it has a number '3' next to it which I'm guessing is the number of reviews? I like that the button is in quite an obvious place so I think most people will be able to find that quite quickly. I'm going to tap on the reviews section... And there's a list of all the reviews. Each one has a title, a star rating and some text. This looks quite similar to other apps so I feel quite at home with it. So yeah, there's a five star review here... A two star review... and finally another five star review."

#### **Task 6**

"So the first thing I need to do I guess is find the restaurant Carluccio's... From the last couple of tasks I'm thinking the best way to do that would be to just search for it. So I'll tap the search bar and type in Carluccio's. \*Types in Carluccio's and looks at the results\*. The first result is the closest so I'm guessing that's the one you want me to use?"

**Prompt: That's correct.**

"Ok. So I'm back to the restaurant information screen and I'm looking for an option to place an order. I can see what's on the menu so maybe I'll try tapping that. Alright, now I can see a few different dishes... There's a bar at the top that lets me change from starters to mains which is quite good - most of the apps I've used like Deliveroo and stuff like that just list everything all at once, which makes it a bit hard to find things. I can also see some buttons to add and remove stuff, so I'm guessing this is also how you place an order. I'll try adding a pizza... Oh, now a new bar appeared at the bottom. It's red and it says a price as well as the text 'checkout'. I'm thinking the price is probably the overall total. I'll add a few more things just to see... Yeah, the price has gone up and so has the

number of items. Ok so let's check out... \*Taps the checkout bar\*. Now I'm looking at a list of all the items that I've just ordered. Looks good to me, there's an option to pay by card which is what I want to do here. I'll tap that. And now there's the usual text boxes to enter the payment information so I'll do that... \*Enters information\*. There's a button which says 'Save Information'... I'm guessing I'll be able to use that card in future too since it says 'save'... To me that means it will remember it for next time. I think that would be quite a handy feature. I'll tap the button which says 'confirm order'... And it's done!"

**Prompt: Great. Was there anything about that process you didn't like or was it all good?**

"Erm... It seemed ok really, not too different to other apps I've used, in fact probably a bit better in the way the menu was laid out. I did think it was a bit confusing at first when you're looking to place an order... The button, which I think said 'see menu', might not be the most obvious thing. Maybe that could have a different name like 'order food' instead and I would have gone straight to it."

**Task 7**

"So this task seems pretty similar to the last one. I'll start by searching for the restaurant... \*Types in Wagamama\* And there it is at the top. I like how the list of restaurants has a photo included as well rather than it just being a plain list. So I'll click on Wagamama and go to their menu. Ok so I'm currently in the 'Mains' section right now at the top of the screen which is what I want. I'm scrolling to see if I can find Beef Ramen. Ok I've found it! So I'll press the 'plus' button just like last time to add it to my order. The quantity next to it has gone up to one and I need two, so I'm thinking if I tap it again I'll add another one. Yep, that worked! Now I'm looking for a side order of Chilli Squid... Ah ok, so I'll change the section of the menu at the top from 'Mains' to 'Sides' and see if that's where it is... Yeah, I can see it right at the top. I'll add that too. I'm thinking it might be nice if some of these menu items had photos next to them, that might make it a bit easier to find stuff at a glance. Ok, that's all I needed, so I'll press checkout again. I'm paying by card again so I'll press that. Oh - this time it's remembered the card I used last time, so I'll just select that. That's quite good, since now I don't have to re-type all the information again. And just like last time I'll press the 'submit order' button."

**Prompt: So did you find it ok to look for specific items on the menu?**

"Yeah, it was quite easy since it's divided up just like a real menu. Like I said though, it might be nice to have photos as well so you can also see what you're getting."

**Task 8**

"Ok... So I'm thinking I could search for that restaurant again and submit a review that way. However, I think there's probably an easier way to do it. I'll check the 'Purchases' tab first since it sounds like that will show me the places I've already been. \*Taps Purchases tab\*. Yeah, I can see that order right at the top of the list. I've just tapped it, and now I can see a list of all the items I had in the order. I can get to the restaurant's page straight from here. Ok, now I'll click on the 'Reviews' section again and... Oh, this time there's an icon letting me leave a review! I can see a screen with a lot of text boxes on it and some stars. The text boxes have labels inside them like 'Title' so it's quite obvious what I need to put in them. I'm guessing the stars are used to rate the restaurant too... \*tries tapping them\*. Yeah, they turned a different colour. I'll rate this restaurant 4 stars for now and just type something random into the review box. And now I'll press the 'Submit' button at the top of the screen."

**Prompt: What made you go to 'Purchases' rather than searching for the restaurant again?**

"Not really sure... I think if I wanted to review something on any other website I'd probably find it in my purchase history first instead of trying to find it all over again - I personally just find it quicker."

#### APPENDIX V: NON-PARAMETRIC WILCOXON SIGNED RANK COMPARISON DATA COLLECTION

Users were given a Likert Scale questionnaire involving two statements, and were asked to give a score between 1 and 10 for how strongly they agreed with each statement, with 1 being Strongly Disagree, and 10 being Strongly Agree. Using a Likert Scale allowed us to capture the intensity of the users' feelings towards each statement for each application. The first statement was "How likely would you be to use this app for ordering food", and users were asked to respond based on two different applications; Gastroview, and Ordoo, which is an application currently used and highly rated on the app store. This part of the questionnaire purely focused on gathering opinions on how good users think each app supplies the food ordering experience. The second statement was "How likely would you be to read and/or share restaurant reviews using the app", and the applications to respond to were Gastroview and TripAdvisor, which is a widely praised reviewing system for travel locations. Two other existing systems had to be used, as currently there is no application with functionality that matches that of Gastroview. This experiment involved one independent variable (applications), two conditions for each statement (Gastroview and another existing system), and involved using the same participants, following a within-subjects design. Once the experiment data had been gathered, we then used a Wilcoxon Signed-Rank test to compare the two data samples, to see how much their population mean ranks differ. This was the most suitable test to use, as the experiment followed a within-subjects design and had only two related samples (conditions). To perform this test, a piece of software called SPSS was used. This software is designed for performing these types of statistical tests, and made performing the Wilcoxon Signed-Rank test much easier for us to perform.

Activity 1: Comparison with existing food ordering system (Ordoo)

**"How likely would you be to use this application for ordering food?"**

**1-10 rating:**

- 1 = Extremely Unlikely,
- 10 = Extremely Likely

Participant	A: Gastroview	B: Ordoo
1	8	7
2	5	1
3	8	4
4	5	8
5	9	8
6	7	5
7	8	6
8	8	8
9	1	5
10	6	4
11	5	7

<b>12</b>	8	8
<b>13</b>	8	3
<b>14</b>	5	4
<b>15</b>	4	2
<b>16</b>	9	7
<b>17</b>	2	6
<b>18</b>	8	9
<b>19</b>	9	8
<b>20</b>	7	7
<b>Mean</b>	<b>6.50</b>	<b>5.85</b>

### Wilcoxon Signed Ranks Test (Generated using IBM SPSS)

#### **Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
Gastroview	20	6.50	2.306	1	9
Ordoo	20	5.85	2.254	1	9

#### **Ranks**

		N	Mean Rank	Sum of Ranks
Ordoo - Gastroview	Negative Ranks	12 <sup>a</sup>	8.38	100.50
	Positive Ranks	5 <sup>b</sup>	10.50	52.50
	Ties	3 <sup>c</sup>		
	Total	20		

a. Ordoo < Gastroview

b. Ordoo > Gastroview

c. Ordoo = Gastroview

#### **Test Statistics<sup>a</sup>**

	Ordoo - Gastroview
Z	-1.147 <sup>b</sup>
Asymp. Sig. (2-tailed)	.252

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

Activity 2: Comparison with existing restaurant reviewing system (TripAdvisor)

**“How likely would you be to read and/or share restaurant reviews using this application?”**

**1-10 rating:**

- 1 = Extremely Unlikely,
- 10 = Extremely Likely

Participant	A: Gastroview	B: TripAdvisor
1	3	8
2	7	6
3	5	7
4	8	6
5	5	4
6	6	6
7	1	6
8	8	7
9	9	8
10	7	4
11	5	7
12	2	3
13	9	8
14	7	5
15	8	4
16	4	5
17	5	6
18	8	6
19	9	9
20	10	5
<b>Mean</b>	<b>6.30</b>	<b>6.00</b>

**Wilcoxon Signed Ranks Test (Generated using IBM SPSS)****Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
Gastroview	20	6.30	2.494	1	10
TripAdvisor	20	6.00	1.589	3	9

**Ranks**

		N	Mean Rank	Sum of Ranks
TripAdvisor - Gastroview	Negative Ranks	11 <sup>a</sup>	9.23	101.50
	Positive Ranks	7 <sup>b</sup>	9.93	69.50
	Ties	2 <sup>c</sup>		
	Total	20		

- a. TripAdvisor < Gastroview
- b. TripAdvisor > Gastroview
- c. TripAdvisor = Gastroview

**Test Statistics<sup>a</sup>**

	TripAdvisor - Gastroview
Z	-.706 <sup>b</sup>
Asymp. Sig. (2-tailed)	.480

- a. Wilcoxon Signed Ranks Test
- b. Based on positive ranks.

Activity 3: Comparison of review trust with existing restaurant reviewing system (TripAdvisor)  
**“I would trust a review made using this app.”**

**1-10 rating:**

- 1 = Extremely Unlikely,
- 10 = Extremely Likely

Participant	A: Gastroview	B: TripAdvisor
1	7	6
2	7	6
3	6	7
4	8	6
5	5	3
6	8	6
7	9	6
8	6	7
9	5	7
10	7	4
11	4	2
12	3	3
13	7	7
14	2	1
15	6	4
16	4	5
17	8	6
18	8	6
19	9	9
20	10	7
<b>Mean</b>	<b>6.45</b>	<b>5.40</b>

**Wilcoxon Signed Ranks Test (Generated using IBM SPSS)****Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
Gastroview	20	6.4500	2.11449	2.00	10.00
TripAdvisor	20	5.4000	1.98415	1.00	9.00

**Ranks**

		N	Mean Rank	Sum of Ranks
TripAdvisor - Gastroview	Negative Ranks	13 <sup>a</sup>	10.15	132.00
	Positive Ranks	4 <sup>b</sup>	5.25	21.00
	Ties	3 <sup>c</sup>		
	Total	20		

- a. TripAdvisor < Gastroview
- b. TripAdvisor > Gastroview
- c. TripAdvisor = Gastroview

**Test Statistics<sup>a</sup>**

	TripAdvisor - Gastroview
Z	-2.674 <sup>b</sup>
Asymp. Sig. (2-tailed)	.008

- a. Wilcoxon Signed Ranks Test
- b. Based on positive ranks.

## APPENDIX W: PERSONA BASED EVALUATIONS

### Activity 1: Persona 1 Comments

'Betty' is not very familiar with technology so would likely struggle using our system and would probably rather order normally as it what she is familiar with. In any case, she does not own a smartphone anyway so she cannot access our system. Although, most of her opportunities to use the app would be when she goes out for a meal with her daughter, this would be beneficial to Betty as her daughter, who is likely more used to technology, can order for both of them. That way Betty does not have to worry about her poor eyesight. Also, Betty might struggle to identify what the icons are on the navigation bar because of her eyesight, making it even more difficult to navigate the app.

### Activity 2: Persona 2 Comments

'Rowan' is very in touch with modern technology unlike Betty. Naturally, Rowan would approach the task in a completely different way to Betty, he would likely navigate our system with ease because he is used to using similar systems to ours. It is likely that Rowan may have even used one of the systems researched in our existing systems section (section 2), so using our system probably comes quite naturally to him.

## APPENDIX X: FINAL APPLICATION

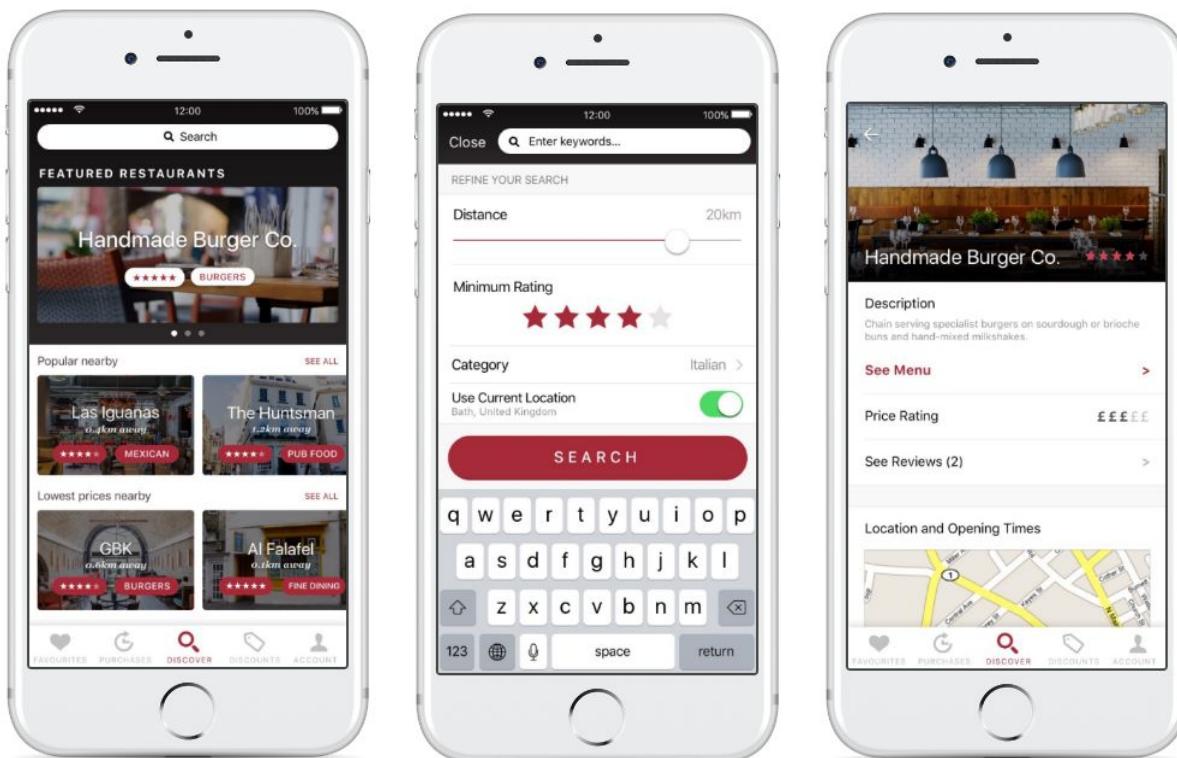


Figure 1: The final application in use.

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