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Mark Freeman
University of Wollongong, mfreeman@uow.edu.au

Alison Freeman
University of Wollongong, afreeman@uow.edu.au

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Abstract

Purpose – Modelling users' interactions online is envisaged to allow developers to increase the usability of online systems and will aid system developers in building better systems to meet users' needs, hereby creating better system design processes. Design/methodology/approach – The normative task model that was developed in this paper was created through an expert review of 14 online grocery stores, using a reverse engineering technique to model the features of the stores' ordering process. Findings – The research identified three main areas of user experience when undertaking the process of adding a product to an online trolley: attempting to retrieve the product, receiving the results of the retrieval attempt, and adding the product to the trolley. These three classifications were used as the basis for an analysis of errors. Practical implications – The findings present a model that can be used to further understand the processes of customers as they engage in an online grocery shopping visit. The normative task model presented is expected to help in the future design of online grocery stores by identifying the possible errors that users can encounter, and methods to reduce the occurrence of these errors. Errors are one area that traditional task-modeling processes ignore, due to their focus on successful processes. Originality/value – This paper presents the innovative process of the development of a normative task model for modelling user interactions when using online grocery stores.

Keywords

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Mark Freeman

School of Information Systems and Technology, Faculty of Informatics, University of Wollongong, Australia mfreeman@uow.edu.au

Alison Freeman

ITC, University of Wollongong, Australia afreeman@uow.edu.au

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Design/methodology/approach – The normative task model that was developed in this paper was created through an expert review of 14 online grocery stores, using a reverse engineering technique to model the features of the stores' ordering process.

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Keywords Online Grocery Store, E-commerce, Process design, Task analysis.

Paper Type Research paper

1. Introduction

Online grocery shopping has not been accepted as fully as other types of online purchasing such as books, DVDs and CDs. Despite all the potential benefits to a consumer, 50% of users never finish their first grocery shop and only 15% of online grocery shoppers return to shop online again. Clearly, there is a problem. While many factors may play a part in this poor performance, initial research suggests that poor usability of online grocery shopping systems is a major factor and therefore more research needs to be conducted into user design of these types of systems and the type of errors that users could make whilst interacting with these systems.

Initially this paper considers the inherent differences when placing Multiple Product, Multiple Quantity (MPMQ) orders, which are the norm for online grocery stores, as opposed to single product orders. The field of MPMQ ordering has been shown to be of significance in previous studies (fore example see Heikkila *et al.*, 1998; Hansen 2008). A normative task model to support the design of an efficient ordering process for MPMQ orders is presented in this paper. In order to create a task model to support the design of an efficient ordering process for MPMQ orders, it is necessary to understand how online grocery stores are used; this is completed through a process of reverse engineering 14 different online grocery stores.

The application of reverse engineering to review tasks is commonly used in software design and development to determine how an existing system has been designed and the features of that system.

However, reverse engineering can also be used to gather user interface (UI) requirements, which allow the development of improved systems to meet user requirements. This paper presents the process of reverse engineering on a group of e-commerce grocery ordering websites (in this paper these are referred to as 'online grocery stores'), to create a task model of common methods of user interaction with such websites. This normative task model contributes to further development of these types of websites to improve user interaction and design by focusing on the types of errors that users can make while interacting with these systems. While typical task modelling focuses on creating optimal solutions for problems.

2. Designing for Users in a Multiple Product Shopping Environment

One of the major areas in Human-Computer Interaction (HCI) research is how usable systems are with regard to their user interface (UI). The idea behind this research is to use the principles of usability with a focus on the development of the normative task model to guide the design elements of the UI. If something is said to have usability it is easy to use, easy to learn, efficient, visually pleasing, and quick and effective (Bara *et al.*, 2001; Mandel, 1997; Preece, 2000). However, there is no single universally accepted definition of usability suitable for this research. According to the ISO 9241-11 (1998) standard, usability is the "extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use." Preece (2000) explains that, in a practical sense, "usability is concerned with developing computer systems to support rapid learning, high skill retention, and low error rates". For this study the concept of usability will include a combination of both the ISO 941-11 and Preece's definition, and a usable system is defined as: a system that supports the user in a specified context and is effective, efficient, easy to learn, has high retention and has low error rates. These will be the key elements when reviewing the UI of on online grocery system.

The concept of systems evaluation can be traced back to the beginning of systems analysis. Specifically, Usability Evaluation Methods (UEMs) are over 20 years old. A number of different methods have been developed to evaluate the usability of computer systems (Jeffries *et al.*, 1991; Preece *et al.*, 2002). Such UEMs have been developed as the result of much work by both designers and researchers, as they attempt to improve the usability of systems to further meet users' needs (Preece *et al.*, 2002 p. 339). UEMs can involve both experts and users evaluating a system in different ways (Preece *et al.*, 2002). Different evaluation techniques can include, but are not limited to, heuristic evaluations (Nielsen, 1994), usability testing (Rubin, 1994), checklists (Gaffney, 1998) and frameworks (Beier and Vaughan, 2003). These methods aim to predict actual user behaviour and identify issues that may influence usability. However, although there are a large number of methods available, researchers have been unable to reach a consensus about when it is appropriate to use each method (Hartson *et al.*, 2001). For this study it is important to consider the review of systems through frameworks (Beier and Vaughan, 2003) when developing the normative task model.

2.1 Online Grocery Store Design & Features

When designing systems it is important to consider the domain for which the system will operate. For online grocery stores a key concept to consider is the aisle layout of conventional grocery stores. Designers of online grocery stores need to understand the mental models that users associate with grocery shopping in the real-world environment (Badre, 2002). This notion is based on the idea that users of online grocers are likely to have experience with buying goods in a conventional grocery store, and are therefore experienced in determining the aisle location of products. It is the categorisation of products that is important for website designers and developers, with users commonly transferring conventional experiences to the online domain. This notion has also been applied in previous research that used a business process modelling approach (Yenisey, 2007), as opposed to the task modelling used in this research.

2.1.1 Finding Items on the Website

Customers must be able to locate the required product on the website in order for online grocery stores to be used by individuals to complete their grocery shopping online. Online grocery stores have two

main navigational issues. The first is locating items and functions on the screen. The second is locating products from the database; this process is similar to most navigation websites but is somewhat specialised. There are currently two main methods that can be used to find products from the database: Searching (using the in-built search facility) and Linking (traversing the 'aisles'). Previous research revealed that most users initially attempt to use the search facility to add products to the shopping trolley. McGovern (2001) claims that navigation is a major usability issue, with web design based around linking units of content. It is the organization and classification of this content that allows effective navigation, and promotes usability. Therefore, consistent and logical navigation, as well as content layout (Freeman, 2009), is essential on a site that promotes ease of use.

Although both Searching and Linking navigation styles can be found on the web and on websites generally, their usage on online grocery stores is different because of the association with conventional grocery store aisles. Both of these methods have advantages for the consumer and the store; however there is little research in this specific domain to suggest which method has the greater usability and benefit to customers.

Search capabilities are important for helping users locate desired products. With, on average, 70% of a website's users employ a website's search engine, and 43% believe that the search engine is the most important feature on a site (Bannister, 2002). The provision of sorting or prioritising search results allows users to better meet their own needs by allowing users to have more control over the online grocery store. In the case where a user chooses to browse the site (Linking) rather than employ the search facility, it is essential to provide meaningful labels and menu names to aid navigation (Freeman, 2009). Bannister (2002) suggests that strong and relevant cross selling serves as extra navigation for users who wish to browse rather than having a set list, as well as increasing product sales by 'suggesting' associated products.

Navigation is a major factor in website usability as it is a major activity performed by users interacting with websites. This is reflected by the prominent focus on navigation in previous research. Fogg *et al.* (2001) conducted a large study which measured ease of use. Of the five items assessed, three were directly related to navigational issues: 'The site is arranged in a way that makes sense to you.' 'The site takes a long time to download.' and 'The site is difficult to navigate' (Fogg *et al.*, 2001 p. 64). These three factors are relevant to online grocery stores.

Numerous reasons for the importance of effective navigation, and the implications of such navigation, are presented in the literature and include:

- The higher the 'ease of use' of a website (as determined by the user), the greater the credibility of the website and the business in the user's eyes. Ease of use includes navigation factors (Fogg *et al.*, 2001; Roy *et al.*, 2001)
- Users will transact if design is effective. Navigation is one aspect of design therefore, implicitly, users will transact if navigation is good (Tilson *et al.*, 1998; White and Manning, 1998; Aladwani, 2002)
- Users will make more use of the site and more information will be distributed if the website is easily navigable (Silker and Gurak, 1996). Users will discontinue use of a site if it is difficult to navigate (Nielsen, 2000)

2.1.2 Searching to Find a Product

The term 'Searching' refers to the process where a user employs an in-built search function to type in key words (or 'search terms') related to the product that they are requesting. The user may enter details such as the name, brand or type of product. The search terms are typically entered into a field called a search box. This facility searches all records in the website's database, and returns relevant results. The purpose is to create a list of products or categories that will help the user to achieve their goal, and preferably locate the specified product.

As the preferred method for locating products for 50% of users, a website's search function is an essential element of the site's success. The search facility should be located prominently on the home page, so that users are not required to browse to find the search feature (Nielsen, 2000). It is often appropriate to include a search box on the home page. The presence of a search facility in an online grocery store allows users to quickly identify a shortlist of potentially relevant products. There is no equivalent to this in a conventional store. The closest example is a user asking a shop assistant in which section of the store a product can be found.

A study by Nielsen (1997) determined that 50% of Internet users are search dominant, 20% are link (or browse) dominant, and the remainder are indifferent. This indicates that websites must provide a variety of navigation tools and methods to meet the needs of the majority of users. Differences have also been identified between the strategies employed by users who search and by those who browse (Fu and Salvendy, 2002). When a user performs a search, an analytical goal-oriented strategy is used. The browse method is linked to a 'wandering' strategy, with each task requiring a greater number of clicks to find the information. Catering to user preferences is essential for e-commerce websites, as users must be able to easily locate the desired product before they are able and willing to purchase it.

The results of both browsing and searching are displayed in a product list. From the product list, consumers are able to select and purchase their desired product. The format of the product list i.e. the way the results are displayed, has been identified as a significant factor in usability (Vrechopoulos *et al.*, 2004). Consumers expect the results to be displayed in a logical order, preferring alphabetical order to enhance the speed of scanning results. Information about the product, displayed in the product list, should be presented in a consistent order from left to right (for Western sites), with product selection options displayed on the right hand side of the product listing.

2.1.3 Linking to Find a Product

Link or aisle traversal is the process where the user attempts to move closer to their goal state using the links that are built into a system. Linking is the process of a user selecting and clicking on a link on a starting page (typically the home page), which results in a new page loading on their system, this process continues until the user reaches their goal. The Linking method allows customers to explore the website and purchase goods in a manner that is similar to browsing a conventional supermarket. Users view virtual aisles to narrow down the products that are available. Aisle names and product division are often similar to conventional supermarkets. 'Linking' is equivalent to a shopper in a conventional store locating the relevant aisle and then locating the specific product within that aisle (Badre, 2002). Traditional shopping commonly refers to this experience as 'browsing'.

The term 'browsing' in a conventional grocery store has different connotations to 'browsing' on the Internet. When the term 'browsing' is used in relation to the Internet, it suggests that the user is engaged in a non-goal-oriented process and does not have clear aims (Toms, 2000). When using an online grocery store, users are more likely to have clear goals. Therefore, the process of selecting an 'aisle' online is referred to in this paper as Linking. A study by Toms *et al*. (2003) revealed that when category (or 'aisle') labels were inconsistent or not clearly defined on a website, users tended to stop heading down that particular path. This indicates the importance of using logical and clearly defined product categories.

2.1.4 Shopping Trolley

One of the greatest incentives of shopping online is argued to be the persistent shopping trolley (also referred to as a cart) (Bannister, 2002), which allows shoppers to place products in their trolley, and return later to continue shopping. This feature aids sales in several ways. Users can see that the store 'recognises' them, and that they have visited previously (Bannister, 2002). Users can build their order gradually before placing it (Milkman *et al.*, 2010), and can access previous purchases on a repeat visit. The first shopping experience can be time-consuming because users must search for the individual products, however future visits can become more efficient as users are able to choose from a list of their previous purchases (Freeman, 2009). This is a significant incentive to use only one vendor. The

view of the online grocery store presented to the user can be tailored to increase convenience and usability, using customer tracking and behavioural data gathered by the e-business (Bannister, 2002).

3. Methodology

Existing literature does not provide models that describe the use of online grocery stores. The normative task model that was developed in this paper is designed to describe the process of online grocery store shopping, facilitating a better understanding of this process, with the purpose of allowing the creation of better MPMQ ordering systems. For the purposes of this normative task model, a 'task' is defined as: an activity undertaken by the user towards the goal of adding a specific product to their shopping trolley. "The concern of models is utility, not truth" (March and Smith, 1995). The normative task model that was developed is a 'utilitarian' model. Although it is important for a normative model to be accurate and current, it is not necessary for it to provide an ideal or perfect representation of a task. A normative model is one which can demonstrably show a current or sub-optimal representation of a task, which can be further refined at a later date. Increased understanding of the process of online grocery store shopping should be used to inform system development, and therefore increase customer satisfaction and uptake.

The normative task model was developed from the data collected through expert evaluation (i.e. a usability professional conducting a review and/or comparison of a system's features), which determined that similar features and methods of interaction were present across all 14 online grocery stores evaluated. The comparison test was conducted with 14 online grocery systems from the United Kingdom, United States of America, Australia and New Zealand. This provides significant evidence to support the accuracy of the normative task model. The goal was not to produce a prescriptive and universal model, merely to produce an initial normative model, which describes typical interactions.

The model building process was designed to develop a normative task model of possible user interaction paths with an online grocery store interface. The model has been derived from reverse engineering. This proposed normative task model is just one model depicting how a user of an online grocery store can interact with the interface of such a system. It does not intend to explain every way a user can interact with an online grocery store interface, nor can it be considered to be an optimal model of interaction. The reverse engineering was conducted with the use of a "Comparison Test" (Rubin, 1994). This allows judgment of a product (such as a website) at the end of the development lifecycle or in the market place, against its competitors. The objective of these Comparison Tests is to compare two or more different interface styles to review stand methods of conducting tasks. Data was collected through the comparison test to inform the normative task model.

The normative task model describes the task of interacting with the online grocery store interface. In order to deconstruct any task, an analysis of that particular task needs to be conducted. Card *et al.* (1983) are concerned with the psychological aspects of task analysis, claiming that the goal-oriented nature of humans means that analysing the psychology of behaviour in relation to a specific task is similar to analysing that task itself. Humans have limited perceptual and information-processing abilities, and so are forced to adapt to the task environment to attain their goals. If the goals of the task and the task environment are known, it is possible to predict a human's responses (Card *et al.*, 1983). Task analysis, from a more practical perspective, is concerned with identifying tasks that a user should perform and the main properties needed to perform those tasks (Paternò, 2000). Once tasks are analysed and understood, they can be modelled. Many formal modelling techniques, such as the GOMS Model, Use Case Analysis, MAD, Diane+, UAN and FFlows, can be applied to task analysis (Diaper and Stanton, 2004). However, the problem is that "[w]ithout an explicit understanding of the different attributes of these models, it is difficult to select a specific one to achieve one's goals" (Balbo *et al.*, 2004, p. 445). The purpose of this research was to establish a normative view of the systems used by online grocery stores, and so a more informal approach to task analysis was selected. Uden *et al.* (2009) proposed that UML is a viable method to indicate the sequence of operations within web-based applications, of which an online grocery store fits into this category of systems. However, ULM

considers the correct workflow of a process where as this normative task model attempts to address the errors made by users.

A model of interaction at Amazon.com was developed by Paternò using task modeling (De Troyer and Casteleyn, 2003). Figure 1 below shows the Subtask Navigation Model for Fill Shopping Cart for Amazon.com. This process of adding a product to the 'cart' is similar to adding a single product to the trolley in an online grocery store.

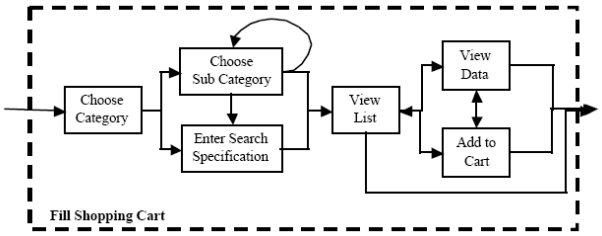

Figure 1. Subtask Navigation Model for Fill Shopping Cart for Amazon.com (De Troyer and Casteleyn, 2003)

The Subtask Navigation Model above was designed for an online shopping environment that typically involves single product, single quantity purchases. Due to the nature of the products available from Amazon.com, users are also more likely to purchase sporadically, and are usually purchasing products for pleasure. In contrast, online grocery stores are typically used for necessary purchases that are made regularly.

The development of a new online grocery store using the normative task model could also be undertaken in the future. The usability of this new online grocery store could then be evaluated against existing online grocery stores to determine whether the normative task model supports the development of more usable online grocery stores.

Following the development of the normative task model a scenario was developed. Balbo *et al.* (2004) define scenarios as an instantiation of a use case in a particular environment; these are mainly represented using narrative descriptions. They describe the setting, the actor(s) and the events of a user-computer interaction of the events that a user will encounter. A scenario presents information about a user's mental activities, however there is no formal notation (Rosson and Carroll, 2001).

4. MPMQ Normative Task Model Development

This section introduces a normative task model developed for online grocery stores that employ MPMQ ordering systems. This model represents the MPMQ ordering process. Throughout this paper several issues that need to be addressed in this normative task model have been identified. These include:

- Method of product retrieval (Searching and Linking);
- Advanced system features of Searching;
- Method of displaying categories in Linking;
- Method of displaying results in both Searching and Linking; and
- Method of product selection and addition to the trolley.

4.1 High Level Normative Task Model

It is important to understand the users' interaction with an online grocery store. The flowchart below (Figure 2) shows: the two methods available to online grocery store users when choosing products; the

way users can change their selection if the product is not found; and the possible repetition of this process until all of the desired products are added to the trolley.

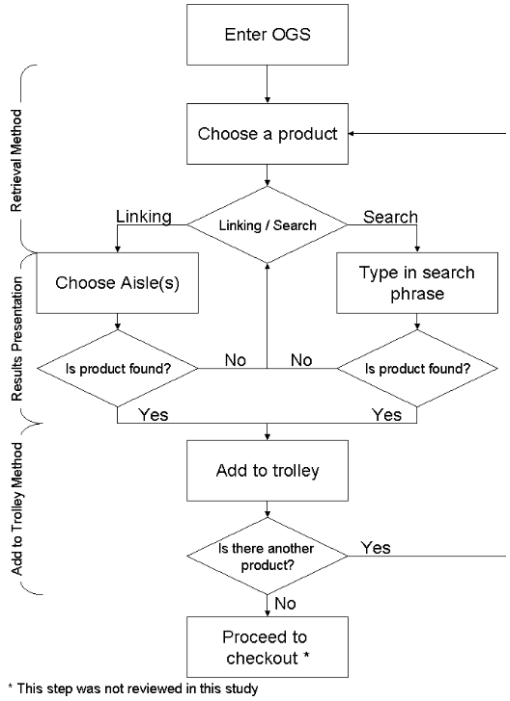

Figure 2. Process of product identification and selection for users of online grocery store

A high level model of the MPMQ ordering normative task model is presented in Figure 3. The model shows the three processes that the normative task model addresses. These are: the retrieval method of the product; the presentation of the results; and the method by which the product is added to the trolley.

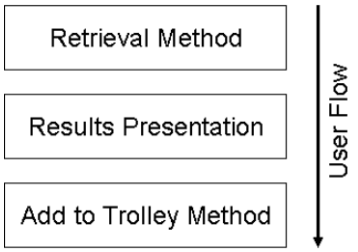

Figure 3. High-Level model of the MPMQ ordering Normative Task Model

The "Retrieval Method" is the first sub-section of this normative task model. It deals with the two methods available to users for obtaining a shorter, potentially relevant, group of products, from which they can choose the product that they require. These two methods are Searching and Linking.

The second sub-section of this normative task model is the "Results Presentation". This deals with the method of presentation for the shorter, potentially relevant, group of products obtained using the user's chosen "Retrieval Method". Two methods available to present this shorter, potentially relevant, group of products are a list format and a matrix (or grid) format.

The final sub-section of this normative task model, "Add to Trolley Method", deals with the method used to add the product to the trolley. An expert review conducted in conjunction with this research, but not presented in this paper, identified that there were several different methods for the addition of

products to the trolley, some of which are more common and more easily recognised by users than others.

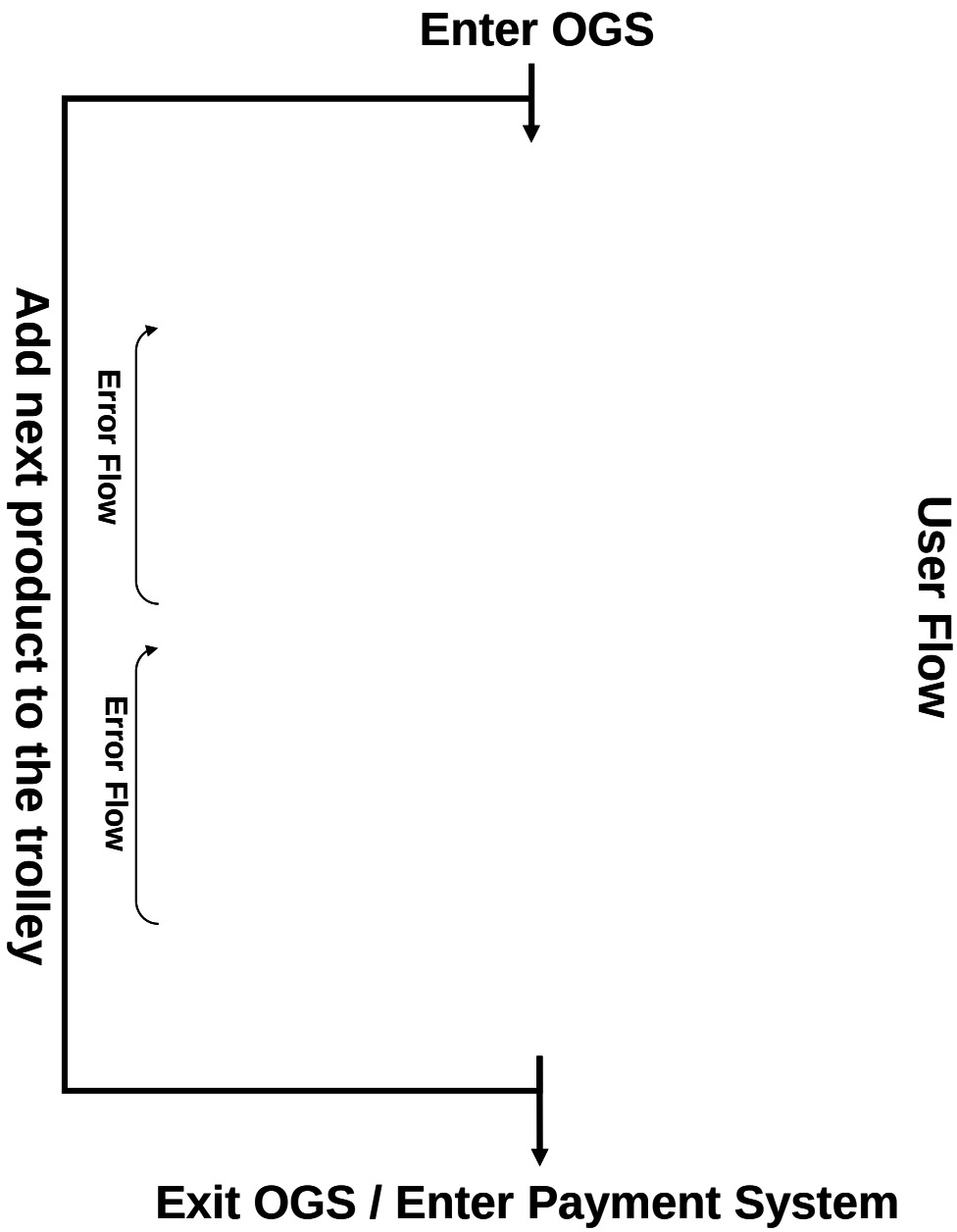

Figure 4. Low-Level model of the MPMQ ordering Normative Task Model

4.2 Retrieval Method

The "Retrieval Method" is concerned with the method used to locate a product. The two methods are Searching and Linking.

A detailed view of the normative task model is presented in Figure 4, which describes the method options, common errors and potential improvements for the "Retrieval Method". To use this diagram, the method is read, for example 'Search'. The type of error made is read, for example 'Spelling errors'. The improvements list then offers possible solutions to the problem, for example a 'Spell checker'. Errors described using the 'common' method are applicable to both Searching and Linking methods.

The main error that can occur during product retrieval was that results were not presented or found after Searching or Linking. Several solutions have been suggested to reduce the frequency of this potential error. Some of these solutions were identified on other online grocery stores. Two of the suggested improvements that can be made to online grocery stores under either method of product retrieval are:

1. All appropriate products in the online grocery store's inventory are displayed, with out- of-stock products indicated; and consistent naming of all products. Some online grocery stores display all products in their inventory, including out of stock products (by placing a image stating this instead of a buy button), allowing the user to make an informed choice when selecting a product.
2. Similar products have similar naming conventions. On some of the online grocery stores reviewed, a number of similar products and the same products in different sizes had different naming structures, such as "Coca Cola Diet 2l" and "Coca Cola Drink Diet 1.25l". Such minor variations in naming structures resulted in a list of products that often appeared to be in an illogical order, with users therefore taking longer to locate the required product.

One significant improvement that could be made to the Linking method is allowing products to appear in multiple aisles. In a conventional grocery store, this is unlikely to occur due to space restrictions and the levels of inventory necessary to do so. However, in an online context these issues are irrelevant. The only consideration for an online grocery store would be to ensure that the results of a search displayed each product only once.

The efficiency of the Searching method could be improved by a variety of changes. A spell checking facility, able to suggest products with a similar spelling to the search term, was suggested by participants. This facility is available at one online grocery store, with a similar feature (mentioned by participants) used on the Google search engine. Some participants referred to this as a "smart" search facility. "Smart" search facilities could also include the grouping of products based on generic concepts or keywords that are not necessarily displayed in the product description, for example returning 'corn flakes' when a user searches for 'cereal'. Numerous participants attempted to use general keywords (such as 'cereal') during the usability testing. Another feature that should be implemented on online grocery store search facilities is to allow/ignore the usage of 's' at the end of terms and allow the usage of standard search mechanisms such as wildcards, operators and symbols ('+', '-').

4.3 Results Presentation

The second sub-section of the normative task model is the presentation of the results. A detailed view of this section is presented in Figure 4. The section of the figure identifies the two methods that an online grocery store can use to present the product results obtained from Searching or Linking: a list format or a matrix format.

Both methods have several commonalities with each other. Errors that are common to both methods include: the user not recognising a product; difficulty determining how to perform another search or follow a linking if the product cannot be found in that particular list/matrix; losing the contents of the shopping list when an express shop facility is used; the selection of an incorrect product to review; and difficultly finding or using the available method to go to the next page of results.

A variety of functions used on online grocery stores could be combined to improve results display. Products can be listed in different ways depending on the user's preferences. Some of the participants in the study stated that they preferred the system to display the products that are most often purchased at the top of the results, followed by an alphabetical listing of all of the products. Another of the improvements that was requested by participants was the ability to show images of the products on the product listing page. However, there should also be the ability to turn off the image facility for users with slower Internet connections. One online grocery store has the ability to display images after a

user clicks on the product name/description but this process introduces further steps into the process of ordering products.

The list format of results display is the most common method used in industry with over 80% of the online grocery stores evaluated using it.

4.4 Add to Trolley Method

The third sub-section of the normative task model is the method used to add a product to the trolley. Before presenting the "Add to Trolley" section of the normative task model it is important to understand a more detailed user flow of this section of the users' interaction with an online grocery store. A detailed view of this section is presented in Figure 4. As can be seen from the figure there are two main methods that consumers use when adding products to a trolley in an online environment: check box and add button. A third method (list select) was only available at one store.

4.5 Scenario

A user of an online grocery system want to conduct their first shopping purchase online to purchase their groceries, they plan to purchase the 50 items (e.g. bread, milk, coffee, sugar etc.) that they have on their list that they would usually take to grocery store. The first task that they need to perform is log onto the online grocery store. The user then will have to deal with the process of the "Retrieval Method" to select a product from a list (virtual aisle) to add this to their trolley (cart).

The first product that the user is searching for is white sugar. The user's first interaction with the system is the selection of "search retrieval" method. They make the potential error and search for "whte sugar". This potential error could result in no items being displayed, however, if the system had a spell checker or a suggested products feature this error would be avoided and the user would be able to move to the next phase of the task model: "Results presentation". If one of these features were not available the user would have to search for the item again. This would create an inefficiency for the user.

The second interaction with the system is in the "Results Presentation" of the process. From the list or matrix display, the user would have to review the displayed items to see if the product that they wish to purchase is available. If it is not available then the user may have to go back a level to the "Retrieval Method" to conduct a new search or link through the aisles. If they come across the product the user would enter the final phase of the model: "Add to Trolley Method". Typically the user could click the buy button located with the product, but what if they wanted two loaves of white bread? This is issue of adding a multiple quantity of a single product is typical with MPMQ ordering. If there is a box to type in the number, the user can select the quantity.

As can be seen from the above scenario, there are a number of stages in which errors can occur while the user is interacting with the MPMQ ordering process. This normative task model is designed to aid system developers in building better systems by giving them an understanding of the situations where a potential error can occur during the process.

5. Conclusion

The normative task model presented in this paper is expected to help in the future design of online grocery systems by identifying the possible errors that users can encounter, and methods to reduce the occurrence of these errors for MPMQ ordering. The normative task model extends the work of De Troyer and Casteleyn (2003) and Yenisey (2007) whose focus was on singular purchases. The process of normative task models is about informing design to allow the shopping process to be simplified, creating better system design from the users' perspective. The novelty of this approach was that the focus was on avoiding potential errors that users made where formal approaches to modelling focus on the overall design and human-computer interaction. Where typically task analysis is about identifying the optimal solution for a design (not all possible user interactions). What needs to be considered for MPMQ ordering systems such as online grocery stores is that users have no training and suboptimal performance needs to be recognised.

The normative task model was developed from the data collected via reverse engineering across 14 online grocery stores evaluated, therefore there is significant evidence to support the accuracy of the normative task model. It should be noted, however, that the applicability of the normative task model to other online grocery stores has not been tested in this research, nor has feedback been sought from online grocery store designers or end users about the accuracy of the model.

The purpose of this research was to establish a normative view of the systems used by online grocery stores, so a more informal approach to task analysis was selected. Further research will be conducted analysing the model developed using formal approaches such as GOMS Model, Use Case Analysis, MAD, Diane+, UAN and FFlows. From the perspective of error analysis and task models 'Systematic Human Error Reduction and Prediction Approach (SHERPA) (Stanton, 2005) or Task Analysis for Error Identification (TAFEI) (Stanton and Baber 2005) will also be explored.

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About the Authors

Dr. Mark Freeman is a Lecturer on the School of Information Systems and Technology at the University of Wollongong, Australia. Mark Freeman has a PhD in Information Systems form the University of Wollongong, Australia. His thesis focused on assessing the usability of online grocery stores to improve customer satisfaction and uptake. His research interests include usability, human-computer interaction and community/social informatics. He has authored a number of international conference papers in these areas. Mark Freeman can be contacted at: mfreeman@uow.edu.au
Dr. Alison Freeman works in the areas of Quality and Compliance at ITC, an enterprise of the University of Wollongong, Australia. Alison Freeman has a PhD in Information Systems from the University of Wollongong, Australia.