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Keywords
online, users, grocery, stores, experiences

Disciplines
Physical Sciences and Mathematics

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Chapter 7
Experiences of Users from Online Grocery Stores

Mark Freeman

Abstract Grocery shopping, traditionally considered as the pinnacle of the self-service industry, is used as the case study in this chapter. As the Internet has become widely used by many segments of the population, the opportunity to shop online for groceries has been presented to consumers. This chapter considers issues that need to be addressed to make online grocery shopping systems more usable for these consumers, based on feedback from individuals who participated in a study of user interactions with Australian online grocery stores.

7.1 Introduction

The ability to purchase groceries via an online mechanism has the potential to significantly alter the behaviour of consumers. The challenge for online grocery stores is to provide a functional method of self-service item selection and ordering that consumers find more convenient than using a conventional self-service grocery store.Grocery stores appeared in the early twentieth century, and over the past 100 years have adapted to become a weekly part of most individuals' lives. The initial concept behind the grocery store was for a self-service, cash and carry facility for consumers. The three factors that led to the initial success of grocery stores were the growth of cities; an increasing population with a rising demand for food; and the spread of the motor vehicle and refrigerator. With these developments, the grocery store has become an institution in western economies.

It is essential for online grocers to realise that, while the public must shop for groceries, consumers have the choice of using conventional self-service grocery stores or their online counterparts. While, originally, many Internet users purchased goods via e-commerce for the novelty factor, online grocery stores

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need to provide a strong incentive for consumers to continue to purchase their goods online once the novelty wears off. To date, this incentive has been advertised as the convenience of being able to purchase from home and the reduced stress involved when shopping for groceries online. A number of studies have found that conventional self-service grocery shopping is the most stressful of all types of shopping (Aylott & Mitchell 1998). The decision to purchase groceries online and the users' perceptions of success are affected by many issues, both online and offline. These issues include the selection process, payment process, receipt of goods, returns, customer service, quality of goods, substitutions, price, privacy, security, time and convenience. The importance of each of these issues varies among users, and is likely to be influenced by the structure of the grocery store (i.e. whether the store is 'web only', or has a physical presence). This chapter will focus on issues of usability related to online grocery shopping.

This chapter presents the results of an extensive case study into the usability of one Australian online grocery store, and identifies issues that need to be overcome by online grocery stores in order to be successful. The results presented will discuss the differences between conventional self-service and online grocery stores, and feedback provided by users who completed the usability testing. This information is used to develop recommendations for necessary features of online grocery stores, which may be used to assist online grocery stores (and potentially online stores in other industries) to provide a functional method of self-service item selection and ordering for their users.

7.2 Background

The development of the Internet has introduced a new shopping medium for consumers. The Internet continues to create a great deal of hype and hysteria, and alongside the more sensational aspects, issues of e-commerce have arisen. One of the major issues that has been identified is the usability of e-commerce websites, as shown in previous studies (Raijas 2002; Tilson et al. 1998). If an online store is unusable then customers are unlikely to make a purchase (James 2001). There have been numerous predictions of a dramatic increase in online grocery shopping in the next few years; however, these predictions are only likely to be fulfilled if online grocery stores provide an efficient and logical shopping experience for consumers. Usable systems are paramount in meeting the expectations of consumers using this self-service medium for their groceries. Most e-commerce usability research has focused on the ordering of single products, and the issue of multiple product multiple quantity ordering, such as in a grocery store, has only been addressed in a very limited way.

With usability being a prime concern for online stores, it is playing an increasingly important role in the development of e-commerce systems such as online grocery systems, and with this various techniques for conducting

usability testing have emerged. These techniques range from informal processes such as heuristic evaluation to formal techniques such as usability laboratories. If usability testing deems a site to be poor in that respect, there is a need to redesign the site, thus mandating a prompt reaction in order to remain competitive in the marketplace.

A set of ten preliminary guidelines have been established during previous research as a basis for orders that deal with multiple product and varied quantity ordering. The preliminary guidelines established (Freeman 2003; Freeman et al. 2003) were as follows:

1. Informative home page
2. Pages should follow a clear left to right path
3. Searching capabilities visible and usable
4. Searching available across multiple columns
5. Logical ordering of results, with consistent naming
6. A separate column for each part of the description
7. Each row differentiated by different colours
8. Clear method for item and quantity selection
9. Buttons differentiated from text and graphics
10. Simple instructions

It can be argued that grocery shopping is fundamentally different to any other typical shopping experience by its nature, in both conventional self-service and online contexts. A typical grocery shopping trip involves selecting and purchasing multiple products with multiple quantities, while other shopping typically involves purchasing one or a limited number of items. Website designers for grocery shopping should reflect these considerations as they endeavour to support users fulfil these traditional patterns of behaviour.

The emphasis and concerns of this research differ from all previous HCI research because of the inherent complexity of placing multiple product multiple quantity orders, as opposed to purchasing only a few items. The issue of multiple product multiple quantity ordering has been shown to be of significance in previous studies (Heikkila et al. 1998) and is of great significance in self-service, with a grocery order having 54 items on average. Harlam and Lodish (1995) identified a difference in mindset for purchasing multiple products as shoppers 'balance' the contents of their trolley. Research has shown that grocery shopping is the most stressful form of shopping (Aylott & Mitchell 1998) due to a range of factors, many of which are removed by shopping online. Previous research in the field of online shopping has also usually focused on the purchase of a 'hard-good', such as a book, CD or item of clothing. These items are fundamentally different to those that a consumer purchases from a grocery store.

One figure suggests that just over 3% of the total grocery sales in Australia occurred online in 2002 (Hannen 2002). There are a growing number of individuals using the Internet to perform their shopping duties. These users are also gaining greater competence and confidence in using such services. There is

therefore a need for the systems to have ever-increasing levels of usability and to ensure that a high level of user satisfaction is maintained.

A study (Raijas 2002) of online grocery shopping in Helsinki, Finland, found that the average user is a woman, 35–46 years old living in a household with children. 73% of customers were women, 88% were under 45 years old and most users had high incomes. A similar situation of the typical online user has been established through this research, with interviews of online stores in Australia indicating that over 80% of their registered customers were women.

Online shopping research has traditionally focused on non-essential items, with the experience designed for enjoyment. Online grocery shopping involves the purchase of essential items, and efficiency is therefore more important than enjoyment. Efficiency is also an issue when it is considered that groceries are usually disposable and therefore need to be repurchased on a regular basis. Groceries are substitutable goods, meaning that if one product is not available then the consumer will usually be able to purchase a similar product as a replacement. Facilities to support the identification of alternate products are currently not available in online grocery stores, but would be of great advantage to consumers. As a result of these issues, online grocery stores are inherently different to other types of online stores.

With the introduction of the Internet and the development of online shopping during the 1990s, individuals were offered the opportunity to purchase their weekly groceries online, releasing the consumer from the stressors associated with conventional self-service shopping. Behavioural and consumer research has proven that the weekly grocery-shopping trip is one of the most stressful shopping experiences that an individual has to undergo (Aylott & Mitchell 1998). By providing access to the grocery shopping process online, consumers are now more able to shop at their convenience and in an environment which is comfortable for them (Kempiak & Fox 2002). With the ubiquitous nature of the Internet providing the possibility of purchasing items in an environment that is familiar to the user, there is scope for reducing shopping-related stress. However, it is still to be determined whether, in reality, online grocery stores are a true alternative to conventional self-service shopping.

When designed well, the basic experience that a user gains from using an online grocery system should be not unlike that of a conventional self-service shop. Browsing allows customers to explore the website and purchase goods in a manner that is similar to a conventional self-service grocery store by viewing virtual aisles to narrow down the products that are available. Online systems also have the advantage of a search facility, which most users associate with the Internet, and this allows a user to locate a product by typing in product descriptors such as the name, brand or type of good. With both methods, lists of results are displayed for the consumer to select from.

Images and explanations are essential to support online browsing and selection, because consumers are unable to touch or see the products they are considering purchasing (Bannister 2002; Consumer Union of U.S. 2000). A limited number of researchers (McGovern 2001; Nielsen 2001) disagree with the use

ofsupporting images, suggesting that 'the web is a literate rather than a visual medium', and is visually constrained, so sites should be based around text due to resolution and screen size limitations. Limited bandwidth also supports this requirement, with users inevitably being impatient and the web being time-sensitive, meaning that information needs to be displayed in a timely manner (McGovern 2001). Lohse and Spiller's (1998) research contradicts these recommendations, stating that the most sophisticated 'list windows' (which combine a description, an ADD button and an image) use both images and extra navigation buttons, such as 'more details'. Hong et al. (2004) corroborate this argument, finding that the design of product listing pages can dramatically influence the users' performance and their attitude to shopping online. By providing a product image on the listing page to support the brand name, the efficiency and effectiveness of finding a product is dramatically increased, and the provision of a vertical list of the products as opposed to that of 'an array' (in a grid) improves performance. Yen and Gwinner (2003) identify four attributes that are of importance for Internet self-service technologies (ISST): perceived control; performance; convenience; and efficiency. These four attributes will be discussed throughout this chapter.

7.3 History of the Grocery Store

Conventional self-service grocery stores have existed in their current form for more than 90 years. The first conventional self-service grocery store, 'Piggly Wiggly Store', was established in the United States by Charles Saunders in 1916. His idea was for a self-service, cash and carry grocery store (Oi 2004). Although this grocery store failed due to the US stock market crash of 1929, the idea for such stores was created. The three factors that led to the initial success of grocery stores were '(i) the growth of cities, (ii) a rising demand for food, and (iii) the spread of the automobile and refrigerator' (Oi 2004). With these developments, the self-service grocery store became a worldwide success.

Over the second half of the twentieth century, grocery stores have established themselves in the Australian retail sector, just like in the rest of the developed world. The first self-service grocery stores in Australia appeared in the 1950s and have since risen to a position of dominance, accounting for 61% of all food and grocery purchases in Australia in 1998–99 (ACNeilson 1998, p37 cited in Pritchard 2000). In 2003–04 'food and non-alcoholic beverages' had the highest average household expenditure of $153 per week, representing 17% of total household expenditure on goods and services (ABS 2003–04). In the United States of America, annual grocery expenditure is around US $540 billion. Australia's largest grocery store group, Coles Myer, had sales in their food and liquor division of AU $19,255 million during 2005 (Coles Myer Ltd 2005). These figures demonstrate that there is an enormous potential market for business to consumer (B2C) e-commerce in the online grocery area.

With expenditure in Australian grocery stores accounting for such a large percentage of household expenditure, numerous grocery stores have established themselves in the market. This provides consumers with the ability to select their preferred supermarket company for regular grocery shopping visits. Since the introduction of the Internet, consumer choices have expanded further and they may now choose to conduct their regular grocery shopping using an online grocery system. In some societies, conventional self-service grocery stores have been incorporated into larger 'supermarkets' over the recent years, with these supermarkets having a wider selection of products. This chapter compares the stressors of using a conventional self-service grocery store with its online counterpart.

7.3.1 Online Grocery Stores

Online grocery stores realise that, while the public must shop for groceries, consumers have the choice of using conventional self-service grocery stores or their online counterparts. While, originally, many Internet users purchased goods via e-commerce out of curiosity, online grocery stores must provide a strong incentive for consumers to continue to purchase their goods online once the novelty wears off (Goldstein 2002). To date, this incentive has been advertised as the convenience and ease of being able to purchase from home. However, this concept of convenience must be extended to the convenience and ease of use of a specific online grocery system, not just the overall idea of online shopping. It is also important to note that the benefits provided by the convenience of shopping online can come at a cost to the user.

Despite predictions of a high take-up rate for online grocery shopping, this has not occurred to date. The slow acceptance of online grocery shopping compared to other types of online shopping has been considered in previous research by analysing the products commonly purchased online (Kempiak & Fox 2002). Products traditionally purchased online are 'hard-good' items such as music and books. In contrast, shoppers are used to inspecting groceries for quality when shopping in a traditional grocery store, and some grocery products such as fruits are considered to be high-touch items (Kempiak & Fox 2002). Shoppers using online grocery stores are not able to 'touch' items to assess quality. Another significant feature of grocery products is their perishable nature, with many products having specific delivery needs, such as refrigeration and a limited life span. The perishable nature of products demands a regular turnover of inventory, often resulting in changing availability of products. This poses an added challenge for online shoppers, as they are forced to vary their purchasing patterns based on limited information. Consumer perceptions regarding the delivery of 'soft-good' items need to be changed to allow for further growth in online grocery shopping (MyWebGrocer 2001).

When designing online grocery systems, a key concept to consider is the aisle layout of conventional self-service grocery stores. Designers of online grocery systems 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 self-service grocery store, and who are therefore experienced in determining the aisle location of items. It is the categorisation of items that is important for website designers and developers, with users commonly transferring conventional self-service grocery shopping experiences to the online domain.

There are three forms of virtual store layout presented in conventional retailing store layout theory (Vrechopoulos et al. 2004):

- Freeform. It is a free-flowing layout with both displays and aisles in different sizes and shapes (this type of layout is generally used in large clothing stores);
- Grid. It is usually set in a rectangular layout of long aisles running parallel to each other (this type of layout is generally used in grocery stores); and
- Racetrack. It is organised into individual semi-separate retail areas with each area being built around a theme (this type of layout is generally used in large department stores).

In conventional environments, it has been found that 'selling floor layouts are extremely important because they strongly influence in-store traffic patterns, shopping atmosphere, shopping behavior, and operational efficiency' (Lewison 1994, p. 289). The layout of an online grocery website significantly affects online consumer behaviour; however, practical research has found that predictions generated from the literature of conventional retailing about differences in the outcome of layouts do not generally hold in a virtual setting (Vrechopoulos et al. 2004). This is in opposition to the proposal for designing a website based on the users' 'mental model' (Badre 2002). Vrechopoulos et al. (2004) and Nielsen (2000a) claim that some of the research findings, such as users taking what appears to be the 'easiest' path rather than the most logical, can be explained by human–computer interaction theories that suggest users prefer simple online design due to the self-service nature of the Internet.

Interviews conducted with major online grocery stores revealed that for one store, of their 200,000 registered customers, only 100,000 had ever made a purchase. Out of these customers, 30,000 had only ever placed one order (Freeman 2003). Completed orders at online grocery stores have an average order size of 54 items. While a user may struggle with an e-commerce website when placing an order for a single item, it is unlikely that users will be willing to repeat the process 54 times if it is difficult or time-consuming. Although the percentage of registered customers who have made a purchase is high, Hicks (2002) claimed that the registration process was the first hurdle in online ordering, with studies revealing high dropout rates during the registration process. Another possible explanation is that the online grocery stores are not usable, causing users to feel stressed during the registration process and thus discontinue using the system.

Due to the repeated nature of grocery shopping, online grocery systems have the potential to develop time-saving features to enable a consumer to complete repeat purchases easily. Research indicates that convenience is a more important factor than cost savings when users decide to purchase groceries online (Bellman et al. 1999). A significant incentive to use only one vendor and shop online is argued to be the persistent shopping trolley (also referred to as a cart) (Bannister 2002; Consumer Union of U.S. 2000), which allows shoppers to place items in their trolley, and return later to continue shopping. The ability to 'recognise' customers on return visits forms the basis for users being able to customise the site (Consumer Union of U.S. 2000). Product information used to build the shopping trolleys commonly includes availability information for each item. This information allows users to make efficient choices, rather than requiring contact from grocery store staff after the order is placed (Consumer Union of U.S. 2000). The trolley feature aids sales in several ways:

- Users can see that you 'recognise' them, and that they have visited previously (Bannister 2002).
- Users can build their orders gradually before placing it (Consumer Union of U.S. 2000).
- Users can access previous purchases on a repeat visit. The first shopping experience can be time-consuming because users must search for the individual items, with future visits becoming more efficient as users are able to choose from a list of their previous purchases (Consumer Union of U.S. 2000). This is a significant incentive to use only one vendor.
- The e-business can gather customer tracking and behavioural data, used to further tailor the site to increase usability (Bannister 2002).

Claims that grocery shopping is the most stressful form of shopping (Aylott & Mitchell 1998) are based on a range of factors including the need to attend a busy store and the transportation of a large quantity of items, which may be difficult for some groups of the population. Online grocery shopping removes these stressors, as ordering can be completed in the user's home and the transportation is completed by the store. Despite these apparent benefits, only about 3% of the total grocery sales in Australia occurred online in 2002 (Hannen 2002). It has been suggested that poor usability is creating new stresses, and this may be a contributing factor to the low usage.

Compared to other forms of shopping, 'grocery shopping has more negative associations. It is a necessity, and even though some consumers experience it as relaxing, it remains something you cannot avoid, something you have to do' (Geuens et al. 2003, p. 244). A list of positive and negative associations related to conventional self-service grocery shopping was developed by Geuens et al. (2003). Of the 15 negative associations, only 1 (the possibility of out-of-stock products) is apparent when using an online grocery store. The negative factors that are removed when purchasing groceries online are as follows: waiting in lines; decayed products; melting products; crowds of people; elderly people; annoying music; no parking spaces; badly manoeuvrable trolleys; bringing back

trolleys on rainy days; narrow aisles; unfriendly personnel; ignorant personnel; and stress before closing hour. An online grocery system may have a different set of negative connotations and/or stressors when users become familiar with the technology, such as the loss of the trolley contents or issues with delivery.

A study conducted in the United States of America (Ahuja et al. 2003) on the current use of the Internet and its future use by both students and non-students presented the following figures about grocery shopping online. The population was classified into students and non-students based on Phelps et al.'s (2000) article, which stated that students were more likely to know how to use the Internet and had less privacy concerns when working online. In 2003, 6.9% of students and 6.8% of non-students were purchasing their groceries online, with 18.6% of students and 9.6% of non-students having future intentions to purchase groceries online. The major reasons that they stated for purchasing products online were convenience, saving time and better prices. The major reasons that they did not purchase products online were privacy/security, customer service, lack of interaction and high prices including high shipping and handling costs. One factor identified by some of the respondents that was especially relevant to the nature of groceries was an inability to touch and feel the product. Online grocery stores have little control over the negative factors identified in the Phelps et al. study (2000). The online stores must therefore work to maximise the advantages of using online grocery shopping, with the focus commonly on usability. With usability being a prime concern for online stores, the field of usability testing has come into prominence. Two clear usability goals have been identified when dealing with e-commerce websites: a clear path to products and transparency of the ordering process (Benbunan-Fich 2001).

7.3.2 Shopping Differences Between User Groups

Links have been identified between user groups (as defined by their online shopping experience) and their behaviour (James 2001). Most online purchases are made by users who have had over 2 years of Internet experience (usually considered 'advanced' or 'expert' users), and have therefore adapted to the medium and the related purchasing arrangements. The typical web customer is one who spends a significant amount of their time on the Internet, indicating that they are an advanced user (Bellman et al. 1999, p. 32). In contrast, only 56% of light Internet users have attempted to make a purchase of any type online (James 2001).

Search facilities must be flexible to be able to cater for different user groups with varying levels of Internet experience, due to the behavioural differences between these groups (Hölscher & Strube 2000). While novice users experienced severe problems when attempting to develop successful queries, advanced users

did not experience such problems (Freeman 2006; Freeman et al. 2006). A flexible system that provides support to all users would be likely to reduce the problems experienced by less experienced users; however, it should not impede the interactions of more advanced users.

7.4 Research Method

As previously stated, many issues affect a user's perception of an online shopping experience. The research described in this chapter considers *usability* issues. Fifty-four users selected items in an online grocery store from shopping lists provided by the researcher. The selection and classification of these users into groups was based on their online shopping experience. All users completed their shopping tasks using the same online grocery store, in a laboratory environment to ensure consistency and comparability of results. This store was selected based on extensive heuristic evaluations of 14 online grocery stores internationally, which deemed this store to be highly usable relative to the other stores evaluated. A store with high usability was chosen to ensure that the results from this research informed best practice, rather than addressing issues of poor design.

7.4.1 Usability Testing

While there is no single definition of usability, for the purposes of this chapter, the key elements in usability are ease of use, ease of learning, efficiency, visual pleasure, speed and effectiveness (Bara et al. 2001; Mandel 1997; Preece 2000). 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.' 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.' If a system is usable then it is believed that a user will be less stressed and their reaction to using it will be more positive.

The term 'usability testing' refers to 'a process that employs users who are representative of the target population to evaluate the degree to which a product meets specific usability criteria' (Rubin 1994). Its use as a research tool is based on traditional experimental methodology, and allows tests to be conducted under a generic title, rather than being required to specify the particular method to be used. Usability testing encompasses a range of methods. Developers are able to gain greater understanding about their website by conducting usability testing, and observing how users interact with it. User interaction is often different to the designer's

envisaged flow of interaction, and usability testing is therefore an important tool to employ, as it can provide valuable feedback on unplanned use and areas requiring improvement.

Usability testing involves evaluating users' experiences of a website through carefully prepared tasks. As users perform these tasks, they are observed and their interactions with the system are logged. The performance of the user is commonly measured by task completion time and the number of errors made during each task. The usability testing process is highly controlled and is usually conducted in a laboratory-style environment. This environment eliminates typical distractions such as answering telephone calls, checking emails or discussions with colleagues. This method was used in this research to assess online grocery shopping because it provides a constant environment for all users conducting the evaluations. It provides constant access times due to consistencies in Internet bandwidth.

Usability testing was used in this research to observe the interaction of users with the chosen online grocery shopping website. On completion of the usability testing, users completed a post-test questionnaire, which recorded user perceptions of the online grocery system. The method of usability testing is based on scientific research (Rubin 1994), where controlled experiments are conducted and the outcomes recorded. These results are then examined to identify trends in the data. For this study, *Camtasia Recorder* was used to record the interaction of the users with the online grocery system. The statistical tool SPSS was used to examine the data.

The test comprised two stages that were 1 week apart. In the first stage, users completed two shopping lists one of 10 products and one of 20 products. In the second stage, users completed one shopping list of 50 products. Each user was required to complete a post-test questionnaire at the conclusion of each round of tests on the online grocery system. This information was used to gain overall feedback of users' perceptions of ordering grocery products online and to conduct a comparison of their views across the three shopping lists.

The recommended usability testing group sample size varies amongst the experts in the field, and is dependent on the type of study that is being conducted. Qualitative testing sample size recommendations range from 5 (Nielsen 2000b) to 12 users (Rubin 1994). However, for the use of quantitative tests Nielsen recommends testing be conducted with 20 users. The discrepancies between experts indicate that there is no generally agreed size for usability testing groups.

For this study a sample size of 54 users was chosen, consisting of three types of users: beginner, intermediate and advanced users of e-commerce websites. Advertisements for participants were displayed on public notice boards, and participants received AU $20 gift voucher as remuneration. Each of these groups consisted of 18 users to give statistically significant results (Cochran & Cox 1957, p. 24). Beginner users had never made an online purchase; however, they were familiar with using the Internet. Intermediate users had purchased

'hard-goods' only online, such as books and CDs. Advanced users had purchased 'soft-goods' online, typically food and clothing items. Each user was required to complete a background/screening questionnaire to determine to which user group they belonged. This questionnaire is based on previous studies about users of websites.

7.5 Results – Usability Test Analysis

7.5.1 User Performance

The following sections present the user performance using the online grocery system based on the average time taken per product when completing the lists of products. The short test consisted of 10 products, each with a quantity of 1. The medium test consisted of 20 products, with some products having multiple quantities (30 items in total). The long test consisted of 50 products, with some products having multiple quantities (75 items in total). The descriptive statistics for the average time per product for the three tests are shown in Table 7.1.

In the three tests, the mean for the advanced users was lower than the mean for the intermediate users, and the mean for the intermediate users was lower than the mean for the beginner users, i.e. the differences in the means were in the direction expected.

An analysis of variance was also conducted across the three tests looking for changes in the average time users spent locating products. The results of the ANOVA between subject effects of the tests and participants were $F(53,106) = 8.364$, $p < 0.001$, which indicates that there is a statistical significance of the difference at the 5% significance level.

The results for the Scheffe comparison (see Table 7.2) indicate that there is a statistical significance at the 5% level between the short and medium tests (p value of 0.000) and the short and long tests (p value of 0.000). However, there is no statistical significance between medium and long tests. This result indicates that the users learnt how to use the online grocery system very quickly, with a 26% decrease in average time per product between the short and the medium tests. No difference between the medium and the long test could be

Table 7.1 Descriptive statistics – average time per product

	All users		Advanced		Intermediate		Beginner	
	Mean	Std. dev	Mean	Std. dev	Mean	Std. dev	Mean	Std. dev
Short test	44.6s	19.57s	33.3s	17.50s	44.1s	16.02s	56.5s	18.58s
Medium test	33.0s	10.75s	26.7s	11.33s	32.0s	6.94s	40.2s	9.30s
Long test	32.9s	10.61s	26.5s	9.37s	30.5s	6.92s	41.8s	9.10s

Table 7.2 Scheffe comparison of between tests for all users – average time per product

Short (I), Medium (J)		Short (I), Long (J)		Medium (I), Long (J)	
Difference (I–J)	p value	Difference (I–J)	p value	Difference (I–J)	p value
11.6630	.000	12.0044	.000	.3415	.974

attributed to the week delay between the medium and the long tests, or fatigue associated with the longer product list.

As stated previously in this chapter, one of the key elements of usability is that a system is easy to learn (Mandel 1997; Preece 2000). This element is especially important for systems such as an online grocery system, because they are self-service and require a great deal of interaction from users. One method of assessing whether a system is easy to learn is to evaluate how long a task takes at different points in time. A benchmark for the analysis of time spent purchasing grocery products was in Polegato and Zaichkowsky (1994), which discussed the purchase of products at conventional self-service grocery stores. This study by Polegato and Zaichkowsky (1994) revealed that an average grocery shopping trip for females was about 60 minutes, while for males it was about 51 minutes. The average time travelling to and from the grocery store was approximately 30 minutes. In this study, the average time for the long test-ordering process was approximately 27 minutes, which is below the times stated in Polegato and Zaichkowsky's study.

7.6 Results – Post-Test Questionnaire Analysis

Although the time taken to add products to the online grocery system trolley suggests that using an online grocery system for grocery shopping is quicker than going to a grocery store, additional information was gathered on the users' perceptions of the system. Each user completed three post-test questionnaires, one after each of the tests. Analysis is based on the two constructs from the Technology Acceptance Model (Davis 1989): perceived usefulness and perceived ease of use. The Technology Acceptance Model (TAM) uses six questions with Likert scale responses (1 – strongly disagree, 7 – strongly agree). The results from these questions are averaged to give the overall rating on the perceived usefulness and perceived ease of use.

The results showed that beginner and intermediate users believed that the online grocery system was more useful than did advanced users during the short and medium tests. This outcome may be explained by Nielsen and Levy's (1994) statement that experienced users rate their satisfaction of systems lower than users with little or no experience. However, for the long test, which closely represents a typical visit to an online grocery system with over 50 items, the perceived ease of use was higher for intermediate and advanced users, who

Table 7.3 Means for perceived usability for the three tests

	Short test	Medium test	Long test
Advanced users	5.21	5.51	5.38
Intermediate users	5.25	5.54	5.15
Beginner users	5.68	5.57	5.62
Total	5.38	5.54	5.20

would have had more experience. Beginners appeared to struggle with the longer list of items based on their lower average ease of use score. Table 7.3 shows the means for the perceived usability of the three tests for each user group, with Table 7.4 showing the means for perceived ease of use.

Fifty-seven different studies were compared by Nielsen and Levy (1994). These 57 studies involved a comparison of two or more systems, with 40 of the studies measuring subjective performance. Nielsen and Levy's meta-analysis of these studies has allowed benchmarks to be created on subjective preferences for systems. The results from Nielsen and Levy's study are comparable with the results from this study, as the methods that were used seem to be compatible. Nielsen and Levy's comparison normalised the studies with differences. The users Nielsen and Levy reported on were from a broad range of backgrounds (beginner through to advanced). The study reported that the subjective preference mean (at a 95% confidence interval) for a 7-point Likert scale was 4.82 $\pm$0.19. However, Nielsen and Levy stated that this is not suitable as a benchmark for two reasons: it has been affected by both systems that the users liked and disliked; and the median of system satisfaction was higher than the numeric middle as users tend to be polite and give fairly high ratings unless they dislike a system greatly. Upon further study, Nielsen and Levy recommended a benchmark of 5.6 for the mean and median for a good quality system, based on the systems that were preferred by the users in the studies evaluated.

Overall, across the three tests in this research the mean for perceived usability was 5.37 $\pm$0.17. This result is slightly lower than the benchmark for a good quality system. For the perceived ease of use, the mean was 5.63 $\pm$0.14. This result shows that users considered the ease of use of the system to be high. Some of these results are also confirmed by the open-ended responses given by users.

Table 7.4 Means for perceived ease of use for the three tests

	Short test	Medium test	Long test
Advanced users	5.58	5.60	5.62
Intermediate users	5.58	5.88	5.73
Beginner users	5.70	5.80	5.30
Total	5.59	5.76	5.55

7.6.1 User Responses to the Open-Ended Question

The open-ended question asked users if they had any comments on the online shopping experience. Many users took this opportunity to state some of the issues that they had whilst shopping using the online grocery system. Some users also provided personal comments about their own shopping habits.

7.6.1.1 Short Test

There were numerous comments made by users in the open-ended section of the post-test questionnaire for the short test. The total number of participants that provided a response, number of comments of a positive nature and number of comments of a negative nature are shown below in Table 7.5 for each participant group.

The positive comments that were made by users after the short test referred to the way that users felt that this process was quicker than purchasing groceries via conventional self-service means. They also felt that searching was easy and that with products being categorised by product type, the lists were easy to navigate. The negative feedback that was given was mainly about the difficulties that users had when attempting to find items using the in-built search function or adding the item to the trolley.

In total, 29 responses (43.9%) of a positive nature and 37 responses (56.1%) of a negative nature were recorded for the short test. Users were impressed with the speed of locating products, and the convenience of the online grocery store overall. The most problematic issue with the online grocery store was adding an item to the trolley. Many of the negative comments from all types of users were due to users' misunderstanding of the online grocery store, indicating that the system should be simplified to address the needs of all users. While there were more negative comments than positive comments, overall the comments were neutral.

7.6.1.2 Medium Test

The total number of participants that provided a response in the medium test post-test questionnaire, number of comments of a positive nature and number of comments of a negative nature are shown below in Table 7.6 for each participant group.

Table 7.5 Participant responses to the short test

	Total responses	Positive comments	Negative comments
Advanced users	15	9	15
Intermediate users	15	12	10
Beginner users	14	8	12
Total	44	29	37

Table 7.6 Participant responses to the medium test

	Total responses	Positive comments	Negative comments
Advanced users	11	4	14
Intermediate users	14	7	10
Beginner users	13	6	10
Total	38	17	34

The positive comments that were made by users during the medium test referred to the way that users interacted with the online grocery store. A number of the comments referred to the fact that users felt it was quicker interacting with the online store the second time and now believed that it was definitely faster than visiting a conventional self-service grocery store. The negative feedback given was similar to that from the short test outlining difficulties using the search feature.

In total, there were 17 responses (33.3%) of a positive nature and 34 responses (66.7%) of a negative nature for the medium test. Users in all categories stated that using the online grocery store was faster and easier than conventional self-service grocery shopping, with some attributing this to their previous experience in the short test. Again, the majority of the negative comments were related to issues with adding products to the trolley. This was a major concern for users. The other issue repeatedly identified in the negative comments was the need for a spelling check facility or a facility to prompt likely product alternatives. The positive comments were widely supportive of the online grocery store, with the negative comments identifying small issues that could be rectified by the online grocery store owner.

7.6.1.3 Long Test

The total number of participants that provided a response in the long test post-test questionnaire, number of comments of a positive nature and number of comments of a negative nature are shown below in Table 7.7 for each participant group.

The positive comments that were made by users during the long test referred to the way that users interacted with the online grocery store compared to a conventional self-service grocery store. One user stated that 'I went shopping yesterday. It took over an hour. This is a lot quicker.' Others felt that the

Table 7.7 Participant responses to the long test

	Total responses	Positive comments	Negative comments
Advanced users	13	6	11
Intermediate users	13	5	14
Beginner users	11	5	8
Total	37	16	33

process became easier after using the system a number of times. The negative feedback given was similar to that from the short and medium tests outlining difficulties using the search feature. Users stated that a spell-checking facility was essential for a system such as this.

In total, 16 responses (32.7%) of a positive nature and 33 responses (67.3%) of a negative nature were recorded for the long test. Positive comments identified that using an online grocery store was faster than conventional self-service grocery shopping, required information (e.g. prices) could be easily identified, the system could be 'learnt', and the search box was easy to use. Negative comments for the long test repeated the comments in previous tests about issues associated with adding a product to the trolley, and the need for a spelling-check feature. Users also became more discerning about the naming and display of product information. As for the medium test, while there were more negative comments than positive comments, the negative comments identified issues that could be resolved by the online grocery store owners. The positive comments were of a more general nature, and included the following statement: 'The process became easy after some practice.'

7.6.1.4 Overall Feedback

Overall there were several comments that were made by a number of users in the different user groups across the three tests. These comments included

- The search facility has no error correction
- The users did not know if a product was not on the shelf or if they had searched using incorrect terms. Previous research (Raymond 2001) found that an inability to find products was one major reason customers do not return to an online store
- Problems with the shopping trolley, including no display of number of items added, total cost or a receipt
- Problems with truncations and plurals (This comment is referring to the system's inability to process truncated terms (e.g. 'bisc' does not return results for biscuit) and its inability to effectively deal with plurals (e.g. 'apples' does not find results containing the word 'apple'). These issues were compounded by the inconsistency of item names in the system.)

Some of the comments that were made by beginner users were actually incorrect. These comments included

- It would be difficult to use this system to find uncommon brands
  - The search facility provides users the ability to search for all products via the same mechanism. The linking is the same as conventional self-service aisles in a grocery store. Therefore, is should be no more difficult to find an uncommon brand compared to a common one
- Quantity has to be changed from zero before adding a product
  - When the check box is clicked, the quantity automatically changes to one

The overall negative comments presented above all identify serious concerns for the users. Addressing these concerns should be of high priority to online grocery systems because users in all user groups identified them, suggesting that experience using an online grocery system would not overcome these problems. The negative comments mainly identified specific problems, and were largely relating to issues associated with adding a product to the trolley. Many of these identified problems could be overcome with a relatively small investment from the online grocery system owner. The positive comments were of a more general nature, with users describing the system as 'quick' and 'easy to use'. On the basis of the content of the comments, it could be stated that the post-test questionnaire responses were of an overall neutral or slightly positive nature.

7.6.2 Stressors

Online grocery system usage styles and attitudes varied, with some testers preferring shopping for groceries online compared with conventional self-service means. This was shown with a number of users stating that online grocery shopping was faster and that they were going to recommend it to family and friends. However, there was no correlation to suggest that age, gender or experience impacted upon how users felt about using the systems. This result was different to previous studies, which stated that experience and age are the influencing factors when using such systems.

Table 7.8 shows the issues and stressors when a customer interacts with both conventional self-service and online grocery shopping environments. The results were obtained from users' feedback in the post-test questionnaire and from previous research (Ahuja et al. 2003; Geuens et al. 2003).

An online grocery store can potentially reduce the stress of grocery shopping as customers can purchase the products from anywhere which is convenient to them at any time. The products are delivered to an address the customer gives the grocery company during a specified time frame. A customer does not have to deal with crowds or trolleys that are difficult to manoeuvre as manual processes are handled by the supermarket staff in an online environment.

However, there are a number of new stressors that a customer could possibly be faced with when purchasing their groceries through an online grocery store. Privacy and security concerns with the website can be minimised by using a recognised company. Issues with the navigation of the system can be reduced through the development of thoughtfully designed websites by the store. While there is no conventional self-service customer service if the customer has an issue with using the site, help pages are generally available. A customer does not have the ability to touch or feel the product, which is traditionally important when selecting fruit and vegetables, requiring the customer to trust the store in providing good quality products. The customers

Table 7.8 Issues and stressors of grocery shopping

Conventional self-service grocery store issues only	Online grocery store issues only
Need to attend a busy store	Privacy/security concerns
The transport of a large quantity of items	Difficulty in finding products
Waiting in lines	Issues with the building search mechanism
Decayed products	Customer service
Melting products	Lack of interaction
Crowds of people	High prices including high shipping and handling costs
Elderly people	Inability to touch and feel the product
Annoying music	Loss of the trolley contents
No parking spaces	Issues with delivery
Badly manoeuvrable trolleys	Issues with the companies website
Bringing back trolleys on rainy days	Issues with the consumers Internet connection
Narrow aisles	
Unfriendly personnel	
Ignorant personnel	
Stress before closing hour	
Conventional self-service grocery store and online grocery store issues (shared)	
The possibility of out-of-stock products	

could also have issues with the website or with their Internet connection, which may cause frustration and stress.

One issue that is common to both conventional self-service and online grocery stores that can potentially cause stress to a customer is out-of-stock products.

7.7 Conclusion

The results from this study into users' interactions with online grocery systems have many benefits for designers of ISSTs. Users learnt how to use the online grocery system quickly, with a 26% decrease in average time per product between the short and the medium tests. The time difference per product between the medium and the long tests was negligible. This could have been due to the week delay between testing and/or fatigue associated with the longer product list. Results show that the interface of an online grocery system can be learned within a short period of time and all users can perform the majority of tasks for which the system is designed. Overall the experiences of users with this type of system were positive. Users described the system as 'quick', 'easy to use' and 'will recommend this to others'. These insights have shown that the use of online grocery systems can reduce some of the stressors associated with grocery shopping. Realistic solutions an online store can implement to reduce potential

stressors for customers include: a smart search facility with in-built spell-checker; an intuitive shopping trolley system; clear presentation of product information and stock levels; and access to more detailed information on the current order. However, it is essential that online stores remember that the usability of the online interaction is only one element of a user's experience with online grocery shopping.

The statistics for adoption of online purchasing show increasing levels of use, and this growing demand is also being experienced in the grocery industry. Many studies have shown that one way to increase the number of households using such services is to offer a more usable and efficient service to the users. The results from the user testing phase of this research could be used by companies to set initial benchmarks for their online grocery systems, as the only benchmarks available to date relate to conventional self-service grocery stores. However, the benchmarks developed in this study are by no means comprehensive. Further analysis of other online grocery systems via usability testing with online grocery system users would be needed to provide a representative analysis for comprehensive online grocery system benchmarks.

An important area of further research is the impact of experience on issues such as usability for online grocery systems, and whether it is possible to make use of such systems intuitively. 'Bricks and mortar' grocery stores allow shoppers the ability to locate staff when help is required; however, no such support is available in an online environment with these systems. Such research would require greater rigour in the user selection process, with extensive knowledge of user experience gathered prior to tester selection. This study only asked users whether they had purchased any product or service online and if they had purchased any goods from an online grocery system.

Ensuring that online ordering systems follow usability guidelines will allow users to develop greater understanding and confidence in purchasing online, and provide benefits to both users and online sites. If websites adopt usability guidelines, shoppers are likely to be more willing to shop online, providing benefits to both users and website owners.

This chapter identified several issues that affected users in all experience categories. Addressing these concerns should be of high priority to online grocery systems because users in all user groups identified them, suggesting that experience using an online grocery system would not overcome these problems. These included numerous difficulties with the search facility and the shopping trolley, and a lack of information about product availability. Users believed these issues had an impact on their experience using the online grocery system, and thus had negative associations leading to stressful situations. In this self-service environment, where virtually no support from the online grocery store is available, these key elements of an online grocery store must function effectively for the store to be successful. Many of the identified problems could be overcome with a relatively small investment from the online grocery system owner.

This chapter has presented a case study of a self-service online grocery system. It has been shown that users of such systems experience some issues when interacting with the systems. Although most of the traditional stressors of self-service for groceries are removed when transferred online, new stressors are created that need to be managed.

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