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FACULTY OF SOCIAL SCIENCE AND HUMANITIES

DEPARTMENT OF DESIGN AND TECHNOLOGY

USER-PRODUCT INTERACTION:

USERS AND THE DESIGN OF PUBLIC CONVENIENCE

SANITARYWARE PRODUCTS IN THE UK

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ABSTRACT

The research for this thesis investigated user-product relationships with Local Authority public convenience sanitaryware products. The focus of the research was concerned with the in-use relationships the UK public, and those visiting, have with these multiuser public use products. The research aimed to identify which design attributes were and were not enjoyed, and to represent the views of the UK public.

The literature review highlighted a lack of knowledge in the area of the specific multiuser public use products; toilets, urinals and sanitary waste units. It also highlighted a lack of user-centred research into the design of sanitaryware for able-bodied access use. Due to the sensitivity of the subject and lack of information available, a mixed-methods approach to information elicitation was adopted. Recruiting participation for the studies was also approached with care to demonstrate the validity of the research. In total over 450 self-selected volunteers participated in this research.

Four main investigations were undertaken for this research. The first three aimed to identify a route to ensure that the project would ultimately represent the needs of the users. The fourth aimed to test the medium used for presenting the findings to product designers in a format that would act as a guide when designing products for the removal of human waste.

Online data collection was used to attract a diverse geographic and demographic group of participants. This was coupled with on-street questionnaires performed across several locations in the UK. Person-to-person interviews were later conducted to gather in-depth knowledge of the issues identified in previous studies. This information was compiled into a pamphlet and was used in a design exercise to test the appropriateness of the information when presented to product designers.

It is possible to conclude that the pamphlet, the resulting output of the data analysis of the investigations in this research project, engaged with designers and encouraged them to consider the wider needs of the users. Designers identified that user needs were not simply one of space and physical ability, but encompassed other less tangible attributes. Through designers understandings of these requirements and incorporating them into designs, there will be wider acceptance of these products. This should in turn encourage use and reduce the misuse of these essential everyday products thus resulting in more accessible and acceptable solutions to the elimination needs of the UK public.

ACKNOWLEDGEMENTS

LIST OF PUBLICATIONS

William E.Y (2008). Conference Proceedings; Product Design of Public Use Sanitaryware. Sulabh India. October 2008. Page 51 - 53

Williams E.Y, Bhamra T (2007). The Product Design of Public Use Sanitaryware Products in the UK and how this affects the Users with Specific Reference to Age, Gender and Religion. World Toilet Summit 2007, New Delhi, India. 31st October to 3rd November 2007

Williams E.Y, Porter C.S (2007). Perceptions of Public Convenience Sanitaryware Design in the UK. Include 2007: Designing with People, RCA, London, UK. 1st to 4th April 2007. ISBN 1-905000-34-0

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LIST OF ABBREVIATIONS

AP	Avoidant Paruresis (Shy Bladder Syndrome)
BTA	British Toilet Association
DDA	Disability Discrimination Act
DTI	Department of Trade and Industry
EFC	Elemental Chlorine Free
EU	European Union
FFR	Friendly Rest Room
ICSID	International Council of Industrial Designers
IR	Infrared
LA	Local Authority
LOYA	Loo Of the Year Awards
NHS	National Health Service
ONS	Office of National Statistics
STI	Sexually Transmitted Infection
TCF	Totally Chlorine Free
UCD	User-Centred Design
UK	United Kingdom of Great Britain
UTI	Urinary Tract Infection
WC	Water Closet Toilet
WHO	World Health Organisation
WTA	World Toilet Association

CHAPTER 1: INTRODUCTION

This chapter introduces the research project. The aims and objectives of the research are presented in the context of the research questions proposed for this investigation. The structure of the thesis is also presented to help act as a reference guide through the book.

1.1 Research in the current context

Present research, in the field of public conveniences, is focused on two main areas; design for accessibility for 'non able-bodied users' and the built environment. It is an acknowledged that research is needed in these areas, however, no research has been undertaken to address the issues of the 'able-bodied' users of Local Authority (LA) public convenience sanitaryware products; toilets, urinals and sanitary waste units. The users of these public conveniences have not been consulted about the provisions or about the specifics of their designs. Therefore there was no indication of where these products failed the users, there was only a notion that the users were dissatisfied with the products with which they are provided.

The research, which is reported in this thesis, was conducted through the Department of Design and Technology at Loughborough University and was started in October 2005. The research has relied heavily on user participation, as such, it would not have been possible to complete the study without them. The research in this thesis has involved online and on-street surveys, person-to-person interviews and a design study.

The planning of the studies presented in this thesis and the recruitment of participants was paramount to the success of the research. User-centred design was employed as a methodology and as such, users were consulted thought the research. This also provided some limitations, as such some studies over ran however, with careful planning this was kept to a minimum.

To achieve the starting point of this research, the available literature was reviewed. The findings from this literature outlined that there were no tools available for designers to understand the needs of users of public use products in the context of user-centred design. This became the focus for the research. However, to achieve this it was necessary to investigate the subject from the perspective of the users.

The research problem was; no tools were available to designers to help them to engage with their users when designing products for multiuser public use, in the context of LA sanitaryware products.

1.1.1 Funding

The research presented in this thesis was made possible by a PhD scholarship awarded through the Department of Design and Technology at Loughborough University.

1.2 Research aim, objectives and questions

This section presents the aim and objectives set for this research project along with the research questions that have been answered in this thesis.

1.2.1 Aim

The aim of conducting this research project was to contribute to knowledge an in-depth and detailed understanding of the users' specific needs from the identified public convenience sanitaryware items; toilets, urinals and sanitary waste units. From the information a set of guidelines were to be produced. These were to be aimed at designers, as a tool to aid them with their designing, yet will be based upon consumer needs.

1.2.2 Objectives

In order to achieve the aims of this research several objectives need to be fulfilled. These were;

- to investigate current research into public sanitaryware provisions
- to investigate the main themes of;
    - the built environment
    - regulations and guidelines
    - environment
    - user health
    - product design

- to review current literature within each theme
- to identify areas of interest for further research
- to elicit the needs of the users of public conveniences and the specific items being investigated
- to identify the needs of the UK public and what they require from the public convenience sanitaryware products
- to create and validate a set of design guidelines for use by designers when deigning future products

These objectives were addressed at several stages of the research and these are explained in chapters 4 to 6.

1.2.3 Questions

The research questions for this study were;

1. what were the requirements of the UK users, of able-bodied access public conveniences, who use;
- toilets
- urinals
- sanitary waste units
  - o how does this relate to gender and the items they are currently provided?
2. why do products intended for public use fail to answer the publics' need?
3. how can the user requirements be met through effective product design?
4. how can product designers be aided when designing public convenience products?

1.3 Deliverables

The research project aims to provide several deliverables;

- a clear and concise set of guidelines for best design practice.
- a tool which encourages product designers to consider the consumer needs of the public which shall;
  - o develop the designers comprehension of users', as members of the public, and their needs when using public conveniences

- to contribution new knowledge through the presentation of the research, this will form the basis upon which further research in the field may be based.

1.4 Scope of the research project

The research project mainly focuses upon the users of non-disabled access public convenience sanitaryware products as the major stakeholders and not the providers. The project outcome intended to raise awareness to designers of the need for effective design; to research the consumer need and not presume it. This was to be achieved through user-centred design.

Through conducting the literature review, it was possible to focus on areas of interest, as well as, contribute to the limited research in this field. Following the literature review an initial exploratory study was conducted, this confirmed the areas for further investigation. A large participant based study was then conducted. The areas investigated were directly influenced by the findings from the literature review and an initial exploratory study.

1.5 Personal motivation

In 2003, at Glastonbury Festival of Contemporary Performing Arts the author first discovered the P-Mate®, a device which facilitates women to urinate standing up, and the 'She-Pees' at the festival. These were revolutionary in cutting queuing times for women when needing to urinate. In her final year of Industrial Design and Technology at Loughborough University, she researched, for her dissertation, the "Social and Environmental Impacts of the Toilet in the UK Today, with specific reference to Publicly Available Toilets" (Williams, 2005). She also designed and built a Female Urinal with an integrated sink. The design also used grey water, recycled from the sink, to flush the urinal. This design used the aforementioned P-Mate®. It was when nearing the completion of these projects it was felt there was scope for further work in raising awareness of the users' needs from public convenience sanitaryware products.

The author graduated in 2005 with a 2:1 BA Honours in Industrial Design and Technology and the following October started on her PhD. Since this time, the author has also worked for the British Toilet Association as a Loo of the Year inspector and was able to use this job to further her knowledge and exposure to

the subject area. The research project has been strongly influenced by an industrial product design background, this was important as the research aimed to 'better' the design process for the users by emphasising a change in the design process. The challenge was for designers to be mindful of the users' and not to design for the convenience of the supplier. It is because of this, the focus has been on the users and not the designer. Throughout the project there has been strong emphasis on the users and understanding their needs, this has founded a desire to further the authors' knowledge in Inclusive Design and she now works at the Engineering Design Centre at the University of Cambridge working on the Inclusive Design i~design 3 project.

1.6 Thesis structure

The thesis consists of nine chapters, the content and purpose of each is shown below. This thesis structure is for guidance purposes only.

Chapter 1: Introduction
This chapter outlines the purpose for research project. The aims and objectives of the study are presented and explained.

Chapter 2: Literature Review
This chapter investigates the available literature surrounding public conveniences, 'away from home' conveniences, and user interaction. It outlines the gap in knowledge and the importance of user-centred design. The chapter outlines the main areas of interest for the research project.

Chapter 3: Research Methodology
This chapter outlines the research methodologies for the project holistically. Each investigation has a separate methodology section.

Chapter 4: Exploratory Pilot Study
This chapter presents an initial exploratory study that was performed to confirm the areas for further investigation following the literature review. It was also used to test the appropriateness of using online data collection techniques.

Chapter 5: Investigation into Product use
In this chapter, the methodology and results of an online and on-street study are presented and discussed.

The chapter presents the findings of the research in relation to the research questions and the limitations of this study.

Chapter 6: Investigation into User-Product Relationships

This study involved person-to-person interviews using a mixed-methods approach to interviewing. The data was collected using this methodology, as previous research had been limited to impersonal responses and mainly quantitative data. It was necessary to gather qualitative data to fulfil the research questions.

The results presented in this study are more complete, this is due to the research methodology. It is possible to determine from this study what the users of the public convenience sanitaryware products see as the most important and what the lesser requirements from the products are. The results here are supported by the initial findings from the main study.

Chapter 7: Best Practice Guide

In this chapter, the findings of the research to date are compiled into a 'best practice guide' pamphlet for product designers, it was then tested with industrial product designers.

The design exercise tested the pamphlet, the layout, and the content to ascertain its effectiveness and appropriateness as a tool for engaging with designers when considering the needs of the users for multi-user public use sanitaryware.

Chapter 8: Discussion

In this chapter the findings of the research to date, along with other peripheral but relevant findings that have been produced through conducting this study are discussed.

Chapter 9: Conclusion

This chapter culminates with the conclusions of the research conducted for this thesis. The aims and objectives of the research, how they have been achieved and contributed to knowledge are presented. In addition, the limitations of the research are discussed along with further work, recommended for future studies.

CHAPTER 2: LITERATURE REVIEW

This chapter presents the investigation into the available literature surrounding user-product relationships with LA run and privately funded 'away from home' public conveniences. The literature review outlines the void in current knowledge of the subject and explains the importance of user-centred design as a methodology for gathering this information, as well as the main areas of interest for the research project.

Several issues associated with public convenience design have been identified for research and are discussed in this literature review, they are; the built environment, regulations and guidelines, environment, user health and product design.

2.1 Introduction

It is essential to design around the needs of users, this is because people using the products should be provided with solutions that fulfil their needs and answer their demands. One set of products, provided specifically for multiuser public use is public convenience sanitaryware, and the intention of providing such products is for them to be used by all members of the public. However, these products are multiuser public use products in a public place, with the intention for people to perform a private task.

2.1.1 Aim

The aim of this literature review was to investigate and identify the relevant themes concerning the design of sanitaryware for public conveniences, as well as, how people interact with these products. Particular attention has been given to areas such as the physiological and psychological bearing design has upon the users.

Through conducting the literature review and researching the identified key themes, a comprehensive in-depth understanding of the current information available within the research field has been identified. Concurrently, areas were also identified where there is a lack of knowledge; these areas formed part of the agenda for further research.

2.1.2 Objectives

In order to achieve the aim of this literature review, several objectives required fulfilling. These were;

- to investigate who is currently performing research into public sanitaryware provisions in order to identify experts within the field
- to review current literature within each theme that might relate to;
  - o the influences of sanitaryware design upon the physiology of the user and their use patterns
  - o the effects of sanitaryware upon the users' emotion and how that influences the users' psychological state of well being
  - o the effect sanitaryware has upon the choices both genders make when using it
  - o to identify areas of interest for further research

2.2 Methodology

The main source for the information has been from electronic databases such as MetaLib®, Web of Science® and Google Scholar®. Online databases were used throughout the study as they provided peer reviewed papers and publications, as well as, allowing for comprehensive searching within relevant fields.

Brainstorming and mind maps have been extensively used to collate the information; this has been catalogued on index cards. The index cards cross-reference to the papers by using a numerical system. On each card are key words and coloured stickers. Each colour sticker represents a theme or topic covered within the paper. These were;

- **❍ = product design,**
- **❍ = physiology,**
- **❍ = psychology,**
- ❍ = built environment
- **❍ = other** (Religion, Law, General Interest etc ...)

This system allowed categorising and cross-referencing of the information. After each sticker is a key word that then divides that group up further, e.g. ❍ = **psychology/avoidant paruresis.** Using this system aided writing the literature review, as it was possible to see which papers were relevant to which fields at a glance.

2.3 Identifying a public convenience

Public conveniences are commonly found in many different types of buildings figure 2.1 gives an example of stand alone, building which is purpose built to accommodate public convenience sanitaryware products. This public convenience is in Hinckley, UK; it is situated near a car park and main road. It has gender-specific male and female facilities in which there are disabled access facilities in both, along with a separate unisex baby change, this LA public convenience usually has an attendant present during open times.

Figure 2.1: Station Road Conveniences in Hinckley

2.3.1 The built environment

Some LAs provide public conveniences to help people live their daily lives. For any society to function properly certain basic needs must be accommodated; the provision of functioning public conveniences is one of these.

Providing public conveniences may discourage on-street urination and defecation, which for many people, is both undesirable to witness and live with. Elimination activities; urination and defecation are, by provision of public conveniences, relocated to a specific building or room within the built environment, and can be catered for appropriately (Greed, 2003 a).

It is important to provide people with public convenience facilities, in order to help facilitate a country in continuing its industrialisation and economic growth (Greed, 2003 b). Countries such as the UK are dependent on the economy's strength in order to maintain a major role in world politics. If the economy of a country is weak, then it normally transpires that the political status of a country is also weak (Hoge, 2004). For this reason, it is important not to neglect the high street economy, if it is neglected, it could have a detrimental effect on the

overall economy (Greed, 2005). A strong economy boosts business interest in investing in people from that county as they are seen as 'powerful'; this then increases jobs, promotes business, and encourages economic growth within the country. In the current economic climate, it is necessary to encourage people to spend money to boost the ailing economy. To encourage people to spend money in the high street in times of a 'credit crunch' is important as many high street shop suffer bankruptcy, liquidation and closure such as Woolworths® and Zavi® with these closures people lose their jobs. If the town or city centre is not inviting by not providing basic public services such as, access to public conveniences, this can deter people from visiting towns.

It is important to get issues such as public convenience provision correct in order to facilitate the higher-level issues. However, it appears that many public conveniences are being shut down; whereas in the past, LAs readily provided public conveniences, often with attendants present (Chisnell, 2006). There is no evidence that the needs for these provisions are declining at the same rate as the closures increase. The 'normal' bodily functions of the public still need to be accommodated; this is not aided if valuable public convenience provisions are closed. It is not clear if the closures of many public conveniences are a result of decision makers' reaction to the implementation of the Disability Discriminations Act (DDA) (Hanson *et al.*, 2004 b). Other factors, besides the DDA, also influence decisions to close public conveniences such as the premises being in an unsuitable state and in need of renovation and the cost of upkeep. LAs sometimes use the sale of the premises to create revenue. Perhaps new legislation insisting upon there being public conveniences could help with the battle for increased provision. Currently in town planning regulation, Public Health Act 1936, there are no laws that require there to be any public convenience provisions (Greed, 2003 b). This is except in the case of country parks (Greed, 1996) and the decision can be left to the discretion of the town planner to provide them or not, it is even the case that there are some towns and cities in the UK which do not provide public toilets (Greed, n.d.).

It was reported that in 2002, there was around one LA provided public conveniences per 20000 residents in the UK (The Economist, 2002 a), this level of provision means that there are only about 3300 public conveniences. Even if people do not need to use public toilets, because they have their own facilities, or, other options available to them, it is still important to provide them for those people who do not.

2.3.1.1   On-street urination

One commonly observed environmental sanitary problem is that of on-street male urination (Edwards and McKie, 1997). This issue has been addressed by a number of designers attempting to stop it, and or reduce the frequency of it. On-street urination is considered a problem for several reasons;

- it is unsightly for passers-by
- the urea, in the urine, is corrosive especially to lime stone, causing damage to property
- urine is damaging to wildlife and plants, if in high concentration
- if people are on their own, or separate themselves from a group especially at night, this can leave them vulnerable, specifically if their back is turned to the street

Existing solutions for this include the Dutch on-street male urinal design called the 'UriLift®' (The Economist, 2002 a) shown in figure 2.2. The design is classified as 'street furniture', as it is neither a product, nor a building but a hybrid of both.

Figure 2.2: UriLift® during the day (left) at night (right)

The UriLift® has been installed in several city centres including London, Belfast, Reading, Durham, Stroud, Taunton and Newquay (BBC NEWS UK, 2005). It has been designed with many 'built in' advantages;

- it provides an accessible area for able-bodied men to urinate that does not pollute the surrounding environment
- it offers a shield so that passers-by are not confronted by men who are urinating in full view; all the passer-by will see, is their back
- the design is intended to be vandal proof and to aid this it has been made from stainless steel
- it is self-cleaning
- the UriLift® has been associated with aiding the control of antisocial issues surrounding on-street urination

(BTA, 2006)

The UriLift® rises from pedestrian zones or pavements at night (figure 2.2). The UriLift® is a modern variation of the French of Pissoir, figure 2.3. The Pissoir and the UriLift® share common features, most notably they can only be used by men who stand to urinate. The urinals have been designed exclusively for use by able-bodied men who do not suffer from physical and psychological problems that may prevent them or deter them from using street urinals.

Figure 2.3: A French Pissoir (Gurner, n.d.)

There appears to be no other options available for people who fail to meet the criteria of this user group. There are no designs currently available that would provide women with the same convenient on-street urination facility that able-bodied male have. This situation has an impact upon everyone (Bichard, n.d.) and consequently people who are outside this 'able-bodied group of men', are forced to seek alternatives. , Women, in general, are forced to either use a public convenience, which may or may not be open and available, wait until

they are able to find an alternative solution when out, go home to use their own facilities or indeed perform on-street urination.

2.3.1.2 Sanitaryware for the whole population

Within the built environment, there is a distinct lack of provisions for the elderly, children, women (Ware and Cavanagh, 1992) and disabled (Kitchen and Law, 2001). As a result, people falling into these groups can find it hard to access towns and city during the daytime. Bichard *et al* (n.d.) continue this list of people, who are prevented or even excluded from the built environment of the city or town centre, to include;

- adults with babies or young children
- people who are accompanied by carers
- people who suffer medical condition that affect their ability to use these products
- people with physical, sensory and/or cognitive impairments

Part of this lack of provision has been attributed to the lack of women in the relevant professions that have influencing powers within the built environment (Greed, 2006).

Many public conveniences are accompanied by a unisex accessible facility however, this does not always answer the needs of the users (Bichard, Hanson and Greed, n.d.). This inconvenience of not having access to a toilet facility especially if required 'out of hours'; can mean that the user experiences greater difficulty as a direct result of a lack of provision for them. The lack of provision for these groups is made more poignant by actively encouraging able-bodied men with designs such as the UriLift®. Most of the jobs surrounding sanitaryware design, urban planning and LA decision-making appear to be done by men (Greed, 2003 a). This could have bearing upon decisions that are made when it comes to choosing what sanitaryware as well as the levels of provisions for people outside the group of the 'able-bodied man'.

2.3.1.3 Automatic public conveniences

Automatic Public Conveniences (APCs), figure 2.4, are also categorised under the title 'street furniture' of which the JC Decaux Company are one of the main

providers. They suggest that the APCs offer a *"one stop shop"* solution to people's toileting needs (JCDecaux, 2005). The first APC was installed in the UK in 1983 by JC Decaux (Darwent, 1993). Since then there has been a steady growth of APCs in the UK and now there are around 750 (JCDecaux, 2005). APCs can be seen as an easy option when installing facilities within an urban environment this is because they are not owned by the LA, therefore are not their responsibility. Often, LAs pay a rent to the provider of the APC, the maintenance and upkeep is then the responsibility of the provider. The company that provides the APC also creates revenue from people paying to use them, and as an extra feature, advertisements are added to the inside and outside of the APCs so that revenue can be generated from the sale or letting of advertising space (House of Commons., 2008).

Figure 2.4: APCs Provided by Adshel

One of the major advantages of the APC is that it is possible to access the toileting facilities 24 hours a day. APCs have an automatic wash cycle after each use; they are unattended and are designed to 'look after themselves' (House of Commons., 2008).

APCs provide a valuable service in towns and city centres where free public conveniences are not provided. It is not favourable however, to expect people to pay for the use of public conveniences. Some men choose to urinate in the street rather than pay for the use of an APC. Access to toileting facilities has been described by Jack Sim, the founder of the World Toilet Association (WTA) as a 'basic human right' to have adequate facilities to use (Sim, 2004). APCs are also surrounded by 'myth' people in the UK being frightened of them and finding them too 'public' (Darwent, 1993).

2.3.2 Summary

It appears that in the discipline of the built environment, research conducted into the provisions of public conveniences is a high priority for many of the researchers and academics. Other related issues researched are, how the DDA is influencing design decision making, and how this relates to peoples' lives.

The issues concerning the product design of the fittings and fixtures do not appear to be discussed as a potential cause of concern to the users' health; physical or psychological. It would appear that within the built environment they are very keen to look at the causes of closures and not with the other design related issues. They also tend to concern research and regulations with the basic fixtures and fittings in minimum space requirements. They do not take into account users as people with additional needs in order to access areas. The research being conducted here is not concerned with the product design of the fixtures and fittings for non-disabled access public convenience products such as; the toilet, urinal and sanitary waste units. Although, there have been advances in provisions made available to men, such as the UriLift®, unfortunately this design does not account for user safety, amongst other concerns the users may have. The same issue of access to facilities for women at night time has not been investigated and there appears to be an imbalance in the way these issues are addressed. APCs are available for public use 24 hours a day; however, these require the user to pay to use them. This payment can be avoided by some men who are able to urinate in the street with ease. Research is being conducted into accessibility for disabled users, but there does not appear to be a much research concerned with the 'average' able-bodied public convenience user.

2.4 Regulations and guidelines

With any design, it is important to understand what current regulations and guidelines are in place. It is also necessary to understand the environment in which products will be placed. Different regulations and guidelines relate to different aspects of public convenience provision, design, maintenance, and other areas of public convenience provision. Some of these regulations and guidelines are legal documents, while others are 'optional'. Only British Standards and Acts passed by the Houses of Parliament or European Parliament need to be adhered to, the others are optional.

2.4.1 British Standards

There are three main British Standards that affect Public Convenience Design these are;

- **BS 6465: Part 1: 1994 Sanitary installations**: Code of practice for scale of provision, selection and installation of sanitary appliances (BSI, 1994). This has now been superseded by **BS 6465: Part 1: 2006 Sanitary instillations** (BSI, 2006).
- **BS 6465: Part 2: 1996 Sanitary installations**: Code of practice for space requirements for sanitary appliances (BSI, 1996).
- **BS 6465: Part 3: 2006 Sanitary instillations:** Code of practice for the selection, installation and maintenance of sanitary and associated appliances (BSI, 2006).

According to the BS 6465 Part 1:1994, men are to be provided with 33% more provision than women in public conveniences (BSI, 1994), (Jones, 1994), (WDS, 1991). This extra provision is made, not by increasing the size of the footprint of the public convenience, but by arranging toilets in cubicles and urinals in a fashion so as there are more facilities available for use (Greed, 1995), women are provided with only toilets in cubicles and these take up more room. BS 6465 Part 1 (BSI, 1994) has been superseded by BS 6465 Part 2 (BSI, 1996), however, it is still important to remember that unless a convenience is refurbished, or built from new, the British Standards set 1994 are still the standards that would have hopefully been used as a minimum guide. Through observation, it is clear that men have more facilities than women. In 'rush' times, women are often queuing for facilities, whereas men are more likely to be able to walk in and use a facility without needing to wait.

It is estimated that the average man takes about two minutes from entering to exiting a public convenience (Kira, 1976). This time includes arranging their clothing, urinating and/or defecating, wiping, washing hands, of which only approximately 60% of men do (Kira, 1976), drying hands and exiting the public convenience. Women however, take longer than men; this has been put down by some to women's need to 'groom' (Kira, 1976). It could be argued that women take longer because they have to wait to use a facility or have more clothing to arrange, this is not purely due to 'grooming'. About 25% of all women, post-puberty and pre-menopausal, are menstruating at the same time (Edwards and McKie, 1997), and for this reason alone, women are likely to take longer than men.

Another regulation that has had an impact on LA public conveniences was the BS 6465: Part 2: 1996 (BSI, 1996). This British Standard takes into consideration the needs of the users of public conveniences and in section 10.2 recommends that the dimensions of the facilities in public conveniences, these are the space requirements for the appliances and not requirements of the users, are to be general the same as in "other places" (BSI, 1996: p5). It does recommend that the size of the cubicle in which the toilet is places should be larger, there is no indication given as to what extra space should be provided. This is left to the discretion of the designer, architect, or builder. The standards list three reasons why this extra space is needed, this is because;

> "a) they are used by people likely to be wearing more clothing;
>
> b) users may have luggage or shopping with them;
>
> c) adults may be accompanied by small children; In railway stations, airports and shopping centres many users have bulky luggage or other impedimenta."

(BSI, 1996: p5)

Advice is given about unknown luggage sizes and it is said this "zone should not significantly encroach the WC's activity space" (BSI, 1996: p5); this is again vague and leaves this as optional. It is also said that the toilet should be fitted "off centre" (BSI, 1996: p5) to accommodate the luggage. This is not mentioned as a requirement to accommodate the sanitary waste unit.

BS 6465-1:2006 (BSI, 2006) addressed the requirements of the space provision for sanitary waste units. Section 5.3.5 female toilets says

> "All WC compartments in women's toilets should be provided with a sanitary disposal unit as recommended in BS 6465-3 for the safe disposal of soiled sanitary dressings. WC compartments should be sized in accordance with BS 6465-2, to ensure that the sanitary disposal unit does not touch the WC seat. Storage of waste should be in accordance with BS 5906." (BSI, 2006; 10)

This does not take into account that when a user of the toilet sits on the toilet their leg may still touch the sanitary waste unit.

2.4.2 The Disability Discrimination Act

"The DDA makes it unlawful to discriminate against people with disabilities in the ... provision of goods and services ... within the UK"

(European Community Action Program, 2004: p75)

The DDA came into force in October 2004 it has had an almost instant impact on public spaces (DDA, 1995). Ramps have been added to most shops entrances, and lifts have been installed in buildings amongst other improvements to allow full or at least improved access to all public areas. The introduction of the DDA has also been associated with the reduction of public conveniences. A 2003 survey suggests that 40% of public toilets across the UK had been closed due to the implementation of the DDA (Greed, 2003 b). With closures of public conveniences, and few replacements, it has been predicted by some, that there will be an increased level of on-street urination and defecation (Greed, 1995).

The DDA has requirements specifically concerned with public conveniences and 'away from home' toilet facilities. It asks, *"every feature of public toilets from the cubicle to soap dispenser will need rethinking"* (Hanson *et al.*, 2004 b: p187). This 'rethinking' of all the fixtures and fittings could be seen as an opportunity to update old and impractical designs, as well as an a means to make people's lives better through the employment of effective user-centred design. These design changes will require financial investments to bring the public convenience up to the new standards. Some LAs do not appear to want to make the necessary changes to existing public conveniences and instead they are opting to close them down (The Economist, 2002 a).

2.4.3 The British Toilet Association and other guidelines

The 'Loo of the Year' and 'Attendant of the Year' awards try to identify toilets that are of a high standard by awarding certificates to the premises. This advertises and informs users that the toilets in those premises are of a 'high standard'. The J.D.Wetherspoon's™ Public House chain, along with many high street retailers; McDonalds™, ASDA™, TESCO's™, J Sainsbury's™ to mention a few, opt into the BTA scheme. J.D. Wetherspoon's™ public houses are renowned for providing good toileting facilities. These facilities are on private

property and are not necessarily accessible by all, as it would be expected that the users of these facilities are customers of the public house. In addition, depending upon the type of licence these facilities are located in, children might not be allowed on the premises. It is also not appropriate to expect people to use public houses for visiting toilets; as they may be unable to visit the premises for a variety of reasons, but it is also not right to expect public houses to provide this service to non-customers.

Several other guidelines have been created for public convenience design. Unless these other guidelines are made 'law', they are optional. The BTA run the Loo of the Year Awards. These Awards require inspectors to mark 'away from home' conveniences against a list of predetermined criteria that the BTA believe privately and publically provided conveniences should try to adhere too. The criteria are more concerned with numbers of provisions and the interior layout rather than the actual usability of the design of the products within the conveniences. There appears to have been little, or no user-centred research into what practical criterion of what should be marked in the surveys. The surveys consist of 143 separate questions and do not address the needs of the users, or weight these questions according to their importance. The questionnaire was designed by Richard Chisnell and unfortunately, despite being revised by Mike Bone, the current BTA Director and Loo of the Year organiser along with a panel of toilet inspectors, of which the researcher was a member, they do not accurately consider the needs of men, women, children, elderly, and parents. Several points were raised by the researcher at the meetings and these suggestions were not acted upon. Also, unfortunately the 'prize winners meeting' was not an open debate of which toilets best served the community they were in but was a debate ensuring the same companies, town, councils that won in previous years would not necessarily win in consecutive years. In addition, the criteria of the survey are generic to all 'away from home' conveniences, there are no allowances for the differences between 'private' office conveniences, and a LA provided city/town centre public convenience.

The BTA does recognise the need for improved quality and provision of public conveniences and facilities within them. There is little point providing facilities that are undesirable for the users to visit and use. If the design of the facilities was such that people wanted to use them and look after them, then it might encourage LAs to invest money into opening and refurbishing more public conveniences. If existing facilities could be updated cost effectively then perhaps there would be an increase in public convenience use.

The BTA may view the issue of provision as one that should firstly be solved by providing facilities and then by concentrating on the fixtures and fittings and their designs. Perhaps a different approach would be to try to encourage the LAs to invest in new, and improve upon existing, public conveniences. This could be done through the introduction of cost effective and practical design. The designs would be targeting issues directly related to improving the state of health of the public and this may then lead to a better and more sustainable economy.

2.4.4 Summary

As with any product there are going to be guidelines and regulation that affect the procedures and processes of anything made. There are guidelines that govern aspects of the design of sanitaryware products and these standards must be adhered to and improved upon, there is a lack of any comprehensive guidelines that can facilitate the designer when designing for public places.

There is legislation that governs most aspects of the design of public conveniences; physical space of cubicles, accessibility issues through to water usage, British Standards. The DDA governs particular aspects of accessibility for disabled people in order to remove discrimination in public spaces. There does not appear to be any specific legislation that concentrates upon the provisions for non-disabled users and the products with which they interact.

2.5 Environment

When considering any type of design it is important to understand the effect the design, manufacture, maintenance and use it will have upon the environment. There are some obvious and important issues to understand and consider when designing products that deal with human waste.

2.5.1 Water

Water is the most common way of removing human waste and is used for bodily cleansing, including washing hands. 96% of UK toilets and urinals, domestic, commercial and public, are connected directly to the mains sewerage

works (Harper and Halestrap, 1999). Flushing provides a convenient and quick way to remove human waste from toilets; it is used for several reasons;

- water is an available commodity
- flushes are easy to use
- water gives the impression of cleanliness
- water is good at transporting solid waste

(Harper and Halestrap, 1999)

Because of these reasons, water has been favoured for toilet design; in fact, most design that requires the removal of human waste appears to use water, be that to flush away faeces and urine, or for washing hands and body. Water is synonymous with a clean feeling both physically and psychologically.

When designing with water, all design options need to be carefully considered, it would not be prudent to design a product, which would only be practical to install in a small number of places, even if this product was extremely environmentally conscious as would probably not benefit the environment greatly. If however, a 'better' product, in relation to the wider environmental impact, was designed which was acceptable to a majority of people, and therefore was installed in a greater number of places, then greater environmental benefits would be seen.

Water saving devices such as the 'Hippo', figure 2.5, and the 'Save-a-Flush' has been developed to reduce water consumption. The 'Hippo' acts as a reservoir of water within the cistern, the water inside the 'Hippo' remains in it and it does not get used when the toilet is flushed. The 'Save-a-Flush' is a small bag, approximately A5 in profile size, inside it are silicone crystals that absorb water, once the silicone crystals are saturated they retain the water, this is how water usage is reduced. Each hippo bag save on average 2.5 to 3.5 litres of water per flush on an average 9 litre flush toilet (Ecotopia, 2003). As such, some of these devices can save an average household two thousand gallons of water a year (Save a Flush, 2004). If products that use water were designed to have greater efficiency then these 'add on' products would not be necessary.

Figure 2.5: Hippo Water Saver (BigGreenSmile, 2009)

2.5.2 Paper

Paper is an additional aid for many existing toilets and their design and it is customary for toilet paper to be provided in public conveniences for users to wipe themselves after using the toilet. People need to feel clean therefore until there is a better alternative solution for wiping with paper; this is the option that has been adopted.

On average 83 million rolls of toilet paper are used a day. On average 616 million trees are felled a year in order to make toilet paper (Sanicare, n.d.). Alternatives to toilet paper may be difficult to provide in public conveniences but more environmentally sustainable solutions are available for paper production such as using recycled paper which is totally chlorine free (TCF) (Lewis *et al.*, 2001). Because of the mass use of paper, not just in the sanitaryware industry but elsewhere, there has been a move towards using renewable forests but the problems of paper production do not stop there.

Paper, made from wood pulp, undergoes several environmentally damaging processes in order to become soft and white. Tree pulp can be either chemically or mechanically processed (Lewis *et al.*, 2001). The pulp is also, in many instances, bleached; commonly chlorine is used to do this. Chlorine is potentially environmentally damaging if it gets into the water system, so, alternatives such as elemental chlorine free (EFC) bleaching have been developed to reduce the environmental damage (Lewis *et al.*, 2001).

2.5.3 Maintenance

When designing any product, especially one for frequent and public use, it is important to consider who will be doing the maintenance and cleaning. APCs are designed to be cleaned on an automatic wash cycle after each use (House of Commons., 2008). However, most public conveniences do not have this facility, and are normally cleaned by cleaning staff. Effective cleaning is important for both the cleaners and the users. Products designed to cater for the elimination needs of people should be designed not just with the user in mind, but also so that it lends itself to easy cleaning. If a product is easy to clean; i.e. does not harbour dirt, then it might encourage proper use of the product and might give cleaning staff better job satisfaction. From the literature, especially in the built environment, there is a keen feeling to reintroduce the toilet attendant (Greed, 1995). It is said that a 24-hour toilet attendant should be employed as this may discourage misuse of the premises and would provide an on demand cleaning service.

Another consideration with maintenance is that of the chemicals used to clean the products. Many cleaning products used in public conveniences and home bathrooms have contaminant chemicals. These chemicals can pollute not just the water but also the recovered sludge from the sewerage (Lewis et al., 2001). Ideally, the contaminant chemicals would be removed from the cleaning process. Toto™, Japans leading toilet manufacture, has researched into using pathocatalic materials with a bactericidal coating in order to dislodge waste and remove stains, thus reducing the need to clean toilets with abrasive chemicals. The ceramic coating contains microbiological enzymes; these enzymes kill and digest the bacteria left in the toilet and or urinal bowl. This creates a slippery surface and, in turn, loosens any waste. When toilets and/or urinals are flushed, the waste is removed by the water as it has already loosened by the coating (Laking, 1998). It has been claimed by Toto™ that this coating will last the lifetime of the product. If a coating like this was to be introduced on all products that involved water flushing, this could in turn reduce the amount of chemicals needed to clean them.

2.5.4 Manufacturing process

If the products are to be manufactured from ceramic, it is necessary to understand how this will affect the environment. The production of ceramics

involves using vast quantities of water and requires an extremely high heat temperature processes such as drying and firing. White glaze is often made from lead. Lead is a toxic chemical and can be potentially damaging to the environment (Lewis *et al.*, 2001).

Stainless steel is also often used in the manufacturing of sanitaryware products. Steel is less prone to vandalism than ceramic due to the material properties, for this reason, it could be seen as being more sustainable as it would last longer. However, if vandalism was actively discouraged through employing toilet attendants then ceramic should last the expected lifetime of the product. Stainless steel is expensive to produce in comparison to ceramic.

Ceramic and stainless steel, unless broken will remain working for the longevity of the product. The advantage of ceramic is the glaze protects the surface and therefore the aesthetics of the product where as stainless steel will, with time, become watermarked and as well as showing scratches more readily than ceramic.

2.5.5 Summary

With any design there is also going to be an impact on the environment. Two of the impacts to be aware of when designing sanitaryware are; the use of water and the use of paper. In the UK, most toilets are flushed with water and most people are accustomed to using toilet paper for wiping. The issue of providing these services and calculating their effect on the environment is lacking but there must also be ways of removing the waste especially the paper in order to avoid creating blockages. The design must be thorough and understand the user's requirements as it necessary to cover all aspects of a product's life from 'cradle to grave' (Lewis *et al.*, 2001).

2.6 User health

Maintaining a good level of public health is important in order to run a successful economically secure country (Marc *et al.*, 2006). The National Health Service (NHS) invests large amounts of money treating health issues. If the design of new improved facilities could be used to prevent poor public health then perhaps the NHS and other government health bodies might be able to invest the money in other projects.

In the UK there are, in general, good levels of sanitation. Good sanitation is directly responsible for the reduction in many severe diseases and illnesses that used to affect the UK and unfortunately still affect many areas across the world where sanitation solutions are poor. Some of these illnesses are listed by the World Health Organisation (WHO) are; Campylobacter, this causes gastroenteritis, Cholera, Typhoid and others such as led poisoning through to scabies'. The WHO recommend safe drinking water supplies and proper sewerage as some of the answers to dealing with these waterborne diseases (WHO, 2009).

Toilets, public or private, are generally plumbed into the sewerage system (Harper and Halestrap, 1999). It is this system that helps remove this waste, which if not treated properly can be very harmful to human health, to a treatment centre where water is cleaned before being reintroduced into the British Waterways or back into the pipelines as drinking grade water.

2.6.1 Human physiology

It is important to understand the physiology of the human body when designing something for its use. Form should follow function; if something is easy to use then it is more likely to be used correctly. In the case of the toilet, it is important not just to understand the external physical workings, but also the internal working of the body. Both of these have bearings on the way the body functions. With the current design of the sit-type toilet, it removes any gender identification of the user, as it is not designed for either males or females. The current design appears to have been designed for both genders; however, this does not mean that it is an optimum design.

In the UK today, 2009, it is normal for women to assume a seated position for urination and defecation. Men have an option of whether to stand or to sit for urination, standing is encouraged in public conveniences by placing urinals in them. Men, like women, assume a seated position for defecation. These trends have not always been the case. Clothing is one of the main reasons and constraints that face both men and women when it comes to using toilets, be they in the home or in public.

In 'The Bathroom', Kira (1976) argues that posture does not influence the act of urination, either by hindering, or facilitating it. This view is now outdated and it is proven that posture can influence the ability to urinate efficiently. In a study

of 528 women, it showed that 85% of British women assumed a squatting position figure 2.6 when using a public toilet (Moore *et al.*, 1991).
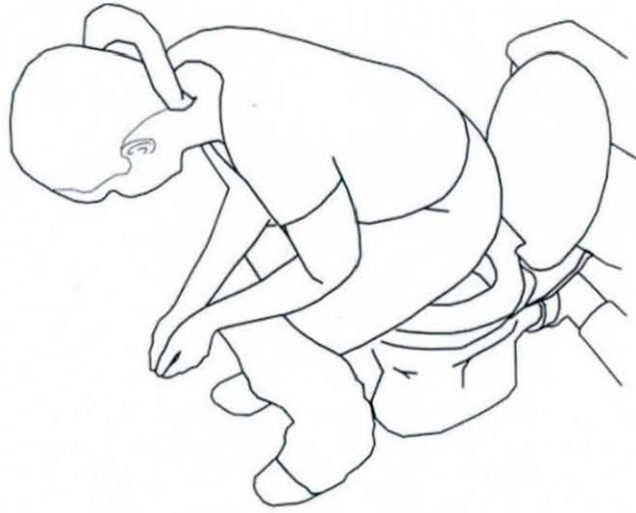
Figure 2.6: Woman assuming a squat position (Williams and Porter, 2007)

12% covered the seat with paper prior to sitting down figure 2.7 and only 2% of British women sat directly on the toilet seat (Moore *et al.*, 1991).

Figure 2.7: Toilet seat prepared with a paper cover

Moore's study (1991) proved that women who urinate in a crouch position have on average a 21% reduction in the urine flow rate; this demonstrates this is not the optimum position. Moore's study also showed that the subjects who adopted a crouch position to urinate were one and a half times more likely to have urine remaining in the bladder. These are more plausible reasons for why women take a longer time than men to use toilets in general, but specifically in public

conveniences. Women do not just have the difficulty of aiming from a crouching position but also a reduced flow rate (Moore *et al.*, 1991). The reasons for women taking longer are not simply down to 'grooming' as suggested by Kira (1976). Kira (1976) does however say that for defecation, the correct posture is of extreme importance in order to facilitate the process, and this view is still regarded as true.

2.6.1.1   Urination

Men in the UK commonly assume a standing position to urinate and with manual manipulation, are able to direct the flow of urine with some accuracy (Kira, 1976). When men urinate from a standing position there is less chance of the bladder being compressed, because in men the urethra is located externally from the body, within the penis, it is very unlikely that it would become kinked leading to a reduced or obstructing urine flow.

Women in the UK are more likely to assume a seated position rather than a standing position when urinating (Moore *et al.*, 1991). In women, it is possible that the bladder is compressed when the user of the toilet is in a seated position thus causing the urethra to become kinked, this could lead to the bladder retaining urine after urination and this could potentially contribute to urinary tract infections (UTI). It is not completely understood why, but around one in four western women suffer from a bladder problem and these problems are more prevalent in women than they are in men (Levinson, 1999). It is possible that a contributing factor for this is anatomical differences between men and women.

The location of the urethra in women means that being able to direct the trajectory of the urine stream whilst seated is difficult. Women are however able to control the angle of the urine stream with accuracy, if practiced, from a standing position by moving their hips and pelvis (Kira, 1976). If women stood to urinate this may increase the amount of urine, they are able to pass from the bladder and could reduce the kinking of the urethra. This in turn could potentially decrease the amount of urine left in the bladder and therefore could reduce the amount of women developing UTI's. Up to 50% of healthy young women suffer from urinary problems and one in 12 women with incontinence in comparison to one in 60 men (Edwards and McKie, 1997). A possible reason for the increased levels of suffers of incontinence in women than men may be due

to childbirth. This reason alone highlights the need to provide adequate facilities as well as anatomically healthy options for women and men. The feasibility of developing a design that would allow women to urinate standing up would require further research from a physiological perspective; but also, the acceptance of female urinals within the public domain would require addressing.

Some people employ 'avoidance techniques' in order to not visit public conveniences, this can also contribute to bladder problems, if urine is retained in the bladder for prolonged periods or if the bladder frequently remains full. By retaining urine, it can in turn increase the urge to urinate (Levinson, 1999).

2.6.1.2   Defecation

It is said, *"defecation is probably one of the most difficult and complex* [neuromuscular actions] *largely because of the potent psychological factors involved in its development"* (Kira, 1976: p114). Perhaps this could be a contributing factor towards the negative view of sanitaryware and toileting habits.

Figure 2.8 shows a diagrammatic representation of the urinary and digestive system. It is obvious, considering the level of complexity of each system that there is a lot of activity in the lower abdomen. It is important to understand how these systems work together and what happens to them in different positions; standing, crouching and sitting and this could lead to a better and more practical solution for sanitaryware design.
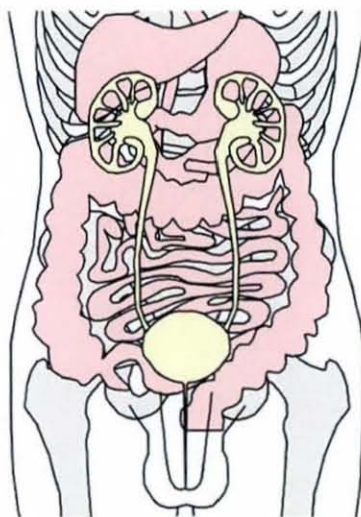
Figure 2.8: The male urinary and digestive system (NDDIC, 2004)

2.6.1.3 Summary

In order to cater for the public and their needs it is essential to understand what influences public health and tackle the issues that need addressing. Public conveniences appear to provide users with only two main designs of facility these are the sit-type toilet; which is the same product for both male and female users of any age and the urinal, this is provided for men.

It is a firm belief that no one general design, such as the sit-type toilet, is an optimum design. There are features from the sit-type toilet that are good but not necessarily correct for both genders. No two bodies are the same, for this reason and for the fact that the products being designed are intended for public use, an optimum general design ideal has been sought. The design of the guidelines will consider the needs of both genders and all age ranges. If a product is intended to be used by men, it should be designed for a man and likewise for women. Men and women differ greatly in their physiology, and it is a known and proven fact that the posture adopted for expulsion has bearing upon the efficiency of the task.

2.6.2 Human psychology

People by their nature and through their education and experience develop relationships with many different products, including sanitaryware. It has been noted that in western society there is a negative approach or feeling towards toilets in general and anything toilet related. The change towards a negative attitude seems to coincide with education and age.

In contrast to the negative feelings expressed by many people about toilets they are also seen as a necessity to own or to have access to regularly. Toilets are more important in the home than most other products (Harper and Halestrap, 1999). If this is true, and this need for toilets is seen to be of such overwhelming importance, it is essential that this facility is provided to the public.

2.6.2.1 Needs

User needs are essential to ascertain to ensure a successful product. Research has been conducted into this field by several researchers. The research

conducted and described by Tiger (1992) has had an influence on changing the way social scientists explore human needs. Jordan (2002) has taken the principals of the four pleasures described by Tiger and has adapted them to make them accessible to social scientists. Jordan (2009) talks of three levels at which a product must work for mass-market success these were;

- **level 1** – functionality; understand how your users function
- **level 2** – usability; understand what is needed to be achieved with reasonable effort
- **level 3** – pleasure ; bring in wider benefits to users

Within this framework are the four pleasures. These four pleasures have been investigated and employed in design for many years as a new approach to understanding users as people (Jordan and Macdonald, 1998). The pleasures taken from Tiger and adapted by Jordan (2002) are;

- **Physio** – physical ability
- **Psycho** – cognitive ability
- **Socio** – relationships
- **Concrete** – family, friends, co-workers
- **Abstract** – society, social status, gender
- **Ideo** – values i.e. yellow is nicer than blue

This framework is interesting as it is about understanding more than the users physical ability but explores the users cognitive capability, this is accompanied by exploring their *socio* and *ideo* status to create products that are acceptable in a mass-market environment. However, this approach does not take into account multiuser public use products that cannot be owned by, tailored or adapted by an individual due to the nature of the product. The approach Jordan demonstrates used personas to identify these four pleasures. The personas are 'imaginary' but still individuals (Jordan, 2002). This approach would not be able to be applied to the target market of this study; the UK public and its visitors. This need to discover more than just the physical is highlighted by Greed who says writes that more consideration should be made to the social aspects concerning toilet provision (Greed, n.d.)

2.6.2.2 Toilet etiquette

"One does not use any facility immediately adjacent to one already in use"
(Kira, 1976: p224)

There is a strong notion of toilet etiquette and it is deeply embedded in many people and can be observed that people practice their own etiquette in most public conveniences. When the conveniences are in high demand some etiquette might not be followed, however, the principals are there. This feeling of toilet etiquette is said to be particularly strong in relation to urinals and sinks (Kira, 1976). People do not just avoid using a urinal or cubicle directly next to one already in use but have a tendency to be trained from a young age not to sit on toilet seats in public. 70% of 528 women interviewed at Hull and Liverpool gynaecological clinics said that they had been told by their mothers never to sit on a public toilet seat, the age range of the women asked was 11 to 83 (Moore *et al.*, 1991). There is no evidence to suggest that young boys are given the same advice as girls as no study has been found to this effect, therefore no comparison can be drawn. This does however prove that there is a strong disdain for public toilets and that young girls are trained to avoid touching them and this avoidance can remain a feature in their adult life. Changing an embedded habit such as this would require radical new thinking to overcome the fears of the users.

2.6.2.3 Bathroom phobias

Avoidant Paruresis (AP) is a bathroom phobia and it can have extreme effects upon the way people live their lives. Paruresis has been described as "*a functional disorder*" by McCracken and Larkin (1991: p297) this causes suffers to become unable to urinate. Some sufferers, in order to make sure that they are within a 'safe distance' of a toilet that they feel comfortable using will not travel far from, or leave the proximity of their homes (Soifer *et al.*, 2001).

Several stimuli have been identified as triggers, causing negative reactions to AP suffers. It is important to understand what can cause these in AP sufferers, as they may be the same or similar for people who do not suffer from the condition so severely, or who just choose to avoid public conveniences. Some of these triggers have been identified as;

Hygiene; AP sufferers are sensitive to the state of hygiene the facilities are in (Soifer *et al.*, 2001).

Smell; Within the room or cubicle one of the most obviously embarrassing and unpleasant factors of toileting is the smell. One way of dealing with the smell is to mask it. This is commonly done through an air freshener but this smell can after time be associated with toilets and become just as bad as the original toilet smells (Kira, 1976).

Sound; It is known that some AP sufferers do not like the sounds of certain materials such as urine hitting stainless steel when used in urinals. AP suffers sometimes also prefer carpeted floors as this absorbs the sounds created when urinating and defecating. There is also suggestion that 'soundscape' music may have a calming effect upon the user as well as help break up and mask sounds created by the users of the public toilets.

People; If there is a queue of people waiting or if there is someone directly behind them, waiting outside the cubicle or at any other point in front of other people (McCracken and Larkin, 1991). Some guidelines have been produced to help people with AP overcome some of the difficulties that they face. One of the problems male suffers have is an issue to do with 'line of sight' privacy. The urinals in figure 2.9 show no separators therefore the users may feel exposed. The urinals are also placed quite closely together, not allowing much room between users. It is unlikely that all four urinals would be used at the same time this links back to the toilet etiquette previously discussed. It would be common to see one urinal left empty between users.

Figure 2.9: Urinals with no dividers

Although urinal dividers are present in many public conveniences, they are not always serving their purpose as they are often set at the wrong height or are the wrong sizes, as shown in figure 2.10, so do not actually help the AP sufferer.

Figure 2.10: Urinals with small dividers

The separators in figure 2.10 offer little privacy and are not seen as being useful to AP suffers. The use of large dividers as shown in figure 2.11 could potentially benefit all users. This is a good example of using design to everyone's benefit.

Figure 2.11: Urinals with large dividers

For a product designer it is important to understand the interior design and environment of public conveniences. It is in this environment that the products will be housed and this can have an effect on the users. It is important for product designers to offer a variety of options that are cost and space efficient but also that offer privacy to the users. One suggestion to increase privacy could be to provide separators between urinals that are shoulder to knee height as this provides users with the most privacy when using screens; this theory is supported by several AP Associations including the UK Paruresis Association. The urinals in figure 2.11 appear to be placed further apart than the urinals in

figure 2.9 allowing more personal space between the urinals, and the urinal separators are of the style which AP suffers are said to prefer as they prefer a more complete screen; shoulder to knee.

Psychological state of mind; If someone knows that, they have a 'problem' this can become magnified when that person is confronted with having to use a public convenience (Soifer *et al.*, 2001). Because of this, it is important to investigate the psychological state of mind of users in order to design successful products that will allow them to feel most at ease. If these negative triggers were removed, or the effect of them reduced, then perhaps this would benefit the public as a whole and not just the AP sufferer.

The physical long term effects of AP are currently unknown, what is known is that if people retain urine in their bladders this can weaken them leading to a potential increased need to urinate more frequently (Soifer *et al.*, 2001); this could also be a contributing factor in developing incontinence. By not fully or properly emptying the bladder it may increase the chances of bacteria build up and thus may cause urinary infections such as cystitis which, in turn, increases the desire to urinate (Edwards and McKie, 1997).

2.6.3 Sex and illegal activities

Crime in the guise of vandalism anti-social behaviour and sex are, to some people strongly associated with toileting (Kira, 1976) (Greed, n.d.). The association has been recognised by Government, and the Sexual Offences Act specifically prohibits sexual acts in public conveniences (OPIS, 2003).This connection could be due to the urethra, anus and the sexual organs being in very close proximity to each other. Sex is another activity people tend to practice in private, similar to the levels of privacy surrounding toileting. It in know that public conveniences are sometimes used for sexual acts and for soliciting.

Public conveniences are known places where drug taking and dealing goes on (Darke, Kaye, & Ross, 2001). This could be due to a lack of surveillance, as toilets are not under surveillance in the cubicle. People may also feel disturbing someone in a cubicle as being rude because there is a psychological barrier that they do not wish to cross. This barrier is one of protecting the privacy of the user, however it may not be the user currently in the cubicle who's privacy is being protected but the person on the outside, as they may not wish to have

their 'visit' to the cubicle disturbed, but also they may not wish to know what is happening in the cubicle. Therefore, once someone is in a cubicle, it is seen a private place and as such it opens itself up for abuse from users. If a toilet attendant was present in the facilities at all times this could possibly help alleviate or reduce this problem. The attendant would be able to keep a check on the facilities and could inform the police or security services should there be any antisocial behaviour in the way of soliciting, sex, drug dealing or taking. The attendants might also offer a sense of security to the users who might otherwise avoid the facilities. The importance of an attendant in a public convenience seems to be one of great importance. If it is not possible to staff the facilities, it might be possible to install unobtrusive surveillance equipment such as the sort developed by EXISTech® (EXISTech Corporation, 2003).

The surveillance equipment EXISTech® has developed is a magic eye and infrared (IR) vision to control the facilities. Public conveniences can be staffed from a central location and could mean that only a small number of people would be needed to manage several conveniences. The IR can detect when a facility is in use and what the facility is being used for. Because the images are of heat patterns, the controller cannot see who the person is when they are using a toilet. The cameras can however detect when objects, such as contraband substance, are passed between cubicle dividers. The cameras are also able to detect the difference between passing objects between stalls and a person changing (EXISTech Corporation, 2003). The cameras are also able to indicate if a toilet has not be flushed by detecting a change in the water temperature and it is even possible to tell if a person has urinated or defecated, figure 2.12, so an automatic flush can be triggered according to the need. The camera can also detect changes in heat on the floor so should someone miss the toilet or urinal and soil the floor or seat, a warning can then be sent to the controller to send someone to clean that specific toilet.
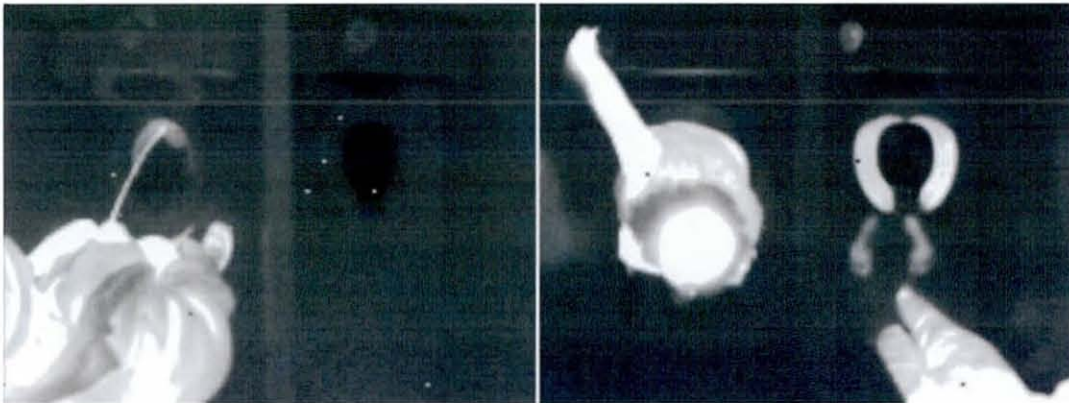
Figure 2.12: EXISTech camera, urination (left) and defecation (right)
(EXISTech Corporation, 2003).

2.6.4 Art

As with many controversial or risky subjects, artists hone in on them and push the boundaries of what is acceptable and even what is art. In contrast to physical art having taken on the subject of toileting there is little available in other art forms; literature, film and television. There appears to be almost a blanket sensor on toilet related issues (Mills, 2006).

In 2003, Monica Bonvicini built and installed the 'Don't miss a sec' shown in figure 2.13. The toilet is a public convenience; it is made from a stainless steel prison toilet in a one-way mirror glass box, the user can see out but the outside world cannot see in.

Figure 2.13: "Don't miss a sec", by Monica Bonvicini (Green, 2007)

Artist Clark Sorensen has used the idea of taking something *"mundane, even ugly ... and transforming it into something different, even something beautiful"*

(Sorensen, 2005). The idea was to make the urinal beautiful, the one shown in Figure 2.14 is of a beautiful flower and not at all like a conventional urinal. The urinal that Sorensen designs are also fully functioning.

Figure 2.14: "Natures call", ceramic art urinal (Sorensen, 2005)

In 1917, Marcel Duchamp submitted a piece of work called 'The Fountain', figure 2.15, for an exhibition in New York; it was entered under the alias 'R.Mutt'. The fountain was a urinal placed on its back with the 'artists' name on it. It caused such a negative reaction from Duchamp's peers and the sculpture was described as "too much" for the show and was removed from the exhibition. It is still unknown where the original is however, a replacement replica was made by Duchamp. The idea behind the piece was to create "*new thought for* [the] *object*" (Stafford, 2005).

Figure 2.15: "The fountain", 1917 (copy) by Marcel Duchamp (Artchive, 2006)

2.6.5 Summary

Understanding the way that people think about and perceive situations is a difficult task and it is not clear if any extensive research has been conducted in this area for the design of sanitaryware. Perhaps this field had not been researched because it was considered taboo or simply too private and that it poses too many difficulties to the researcher. This area of user-centred design and psychology is extremely interesting.

AP is an extreme social phobia and as stated previously, there has been some research conducted into this phobia but nothing conclusive to aid users, when using the products, has been produced through effective product design. For men urinal dividers have been used as a way of providing better privacy when urinating, but issues to do with cubicles and toilet design have not been addressed. No research appears to have been conducted into the effect the materials used have upon the users, and nothing has been done to help designers design products for those people who have AP. It is not only AP suffers who have problems or phobias of sanitaryware, indeed many people appear to share their problem.

2.7 Product design

In recent years, there has been keen media interest in public conveniences and public sanitaryware provisions, this has led to new and innovative designs and has fuelled thought that has produced some interesting results.

Designs such as the pod toilets in Sketch, a restaurant and gallery owned by Mourad Mazouz in London, UK, demonstrate how lighting can be used to create a bright open atmosphere yet each toilet is available to use in an enclosed egg shaped pod which maximises privacy, see figure 2.16 (Brill, Unknown).

Figure 2.16: The pod toilets (Brill, Unknown)

It is important to understand the people who use public conveniences and what kind of lifestyles they lead; be they shoppers with bags, parents with young children and buggies, business people wearing smart clothing, to mention a few. People who use public conveniences might be in a completely different frame of mind or have completely different accessories with them to the same people but in a home setting (Kira, 1976); therefore it is necessary to design around the users' needs and not expect the users to adapt their lives to the resign restraints of the products.

2.7.1 The sanitaryware group

Sanitaryware products have been designed for the use by people when involved in any bodily functions such as toileting and personal cleaning.

The 'group' of public convenience sanitaryware in the UK mainly consists of;

- sit–type toilets
- male urinals
- sanitary waste units

Other products are also in this 'family' but are not the focus for this research. Some of these other products are; sinks, hand dryers, toilet paper dispensers, baby-change tables and soap dispensers.

2.7.1.1 Sit-type toilet

The current design of the sit-type toilet has been said to be so *"overwhelmingly dominant that alternatives have become almost unthinkable"* (Harper and Halestrap, 1999). Toilets are commonly made from vitreous ceramic. The sit-type toilet is the 'standard' design in the UK, figure 2.17, and as such, it is easy to understand how to use it. It is familiar and is what is expected when going to use a toilet, variations on this theme can cause unexpected reactions from users. This style of toilet is designed so that the user is intended to sit on it, although, the toilet can also be used from a standing position for urination by men. Placed on top of the rim of the toilet bowl, is a toilet seat that is commonly made of plastic. The toilet seat was introduced to provide warmth from the cold vitreous ceramic rim (Kira, 1976). Since this type of toilet was designed, there have been no major alterations to the design.

Figure 2.17: Sit-type toilet

The sit-type toilet has some very good features; one of them being the siphon that incorporates an 'S' shape bend, figure 2.18. The siphon, through using the 'S' shaped bend, creates a water trap that is a very effective way of blocking odours from the drainage system, it also acts as a barrier as it prevents germs from spreading. The 'S' shaped bend has proved so successful, that it is now located on most products that connect to a drainage system. The bend also acts as a siphon when the toilet is flushed.
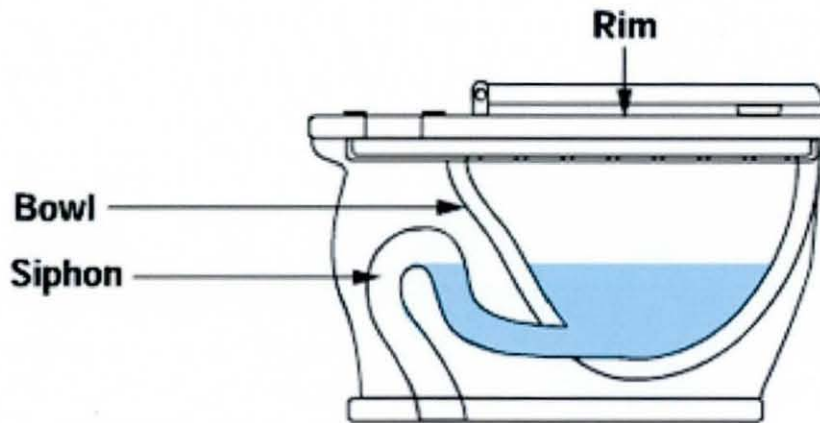
Figure 2.18: Cross-section view of a toilet (Brain, 2004)

One of the design problems of sit-type toilets is the location of the flush. Some people like to flush the toilet whilst or just after defecating in order to mask the sound and the smell (Kira, 1976). The flush is usually located on the top or side of the cistern for mechanical convenience (Kira, 1976).

Splash back is an issue for men and women when using a sit-type toilet. Women often do not sit on a toilet but hover over the toilet this can cause splash back when the urine stream hits the water in the toilet bowl. This can then spray the seat and the user (Kira, 1976). Bacteria such as Trichomonas Vaginalis can be spread this was (Kira, 1976). Trichomonas Vaginalis is the germ that causes Trichomoniasis, this is a Sexually Transmitted Infection (STI), this cannot be passed on by sharing toilet seats as stated in an NHS publication (NHS, 2007). Misleading information can cause people to avoid or incorrectly use sanitaryware products, it is true that germs can be spread this way, it will not cause an infection.

Women often do not sit on seats because they are seen as unhygienic, so opt to hover instead, this means that they are likely to soil the seats and then in turn the next person is likely to hover, and so the problem continues (Kira, 1976). Kira suggests the solution to this problem might lie in 'open ended seats', figure 2.19, where the splash and dribbles of urine would not end up on the seat (Kira, 1976). A design such as this may improve upon many existing as it would avoid creating a wet seat at the front however, this does not combat the problem of when people wet the seat on the sides.

Figure 2.19: Open ended toilet seat

When men use a sit-type toilet to urinate into from a standing position they are aiming at a shallow ellipse and if they do not wish to he heard when urinating men are likely to aim at the inside walls for the toilet this can also cause splash back. Should a man choose to sit on a sit-type toilet there is then the added problem of how to sit. When a man sits on a toilet towards the front of the seat, there is a risk that his penis will touch the inside of the toilet bowl, but he is less likely to soil the back of the bowl. If he sits towards the back of the toilet he risks soiling the toilet, but avoids his penis touching the inside of the bowl (Laking, 1998). All of these issues are potential design considerations when redesigning the toilet.

The friendly rest room project

Researchers at TU Delft have been conducting research into developing a fully adjustable toilet for the elderly and disabled under the heading 'The Friendly Rest Room' (FRR) (Panek *et al.*, 2004) (Buzink *et al.*, 2005). The team working on the FRR project are looking at the product and interior design of public conveniences. The FRR project aims to give people with disabilities, or limited mobility, a better quality of life and more independence.

One of the FRR designs is shown in figure 2.20, this is a toilet that can be adjusted to the preferred height of the user, and it can be tilted to aid the user with manoeuvring on and off the toilet.

Figure 2.20: FRR adjustable toilets, height and tilt (Panek *et al.*, 2005)

The FRR project is driven by user-centred design and achieves innovations by combining technologies and joined-up thinking that allows new design outcomes and possibilities to be explored and realised. One of the findings of the FRR is that the target users of accessible facilities, the elderly, were reported as saying they adapt their behaviour to the facilities they have presented to them (Buzink *et al.*, 2005); in the case of accessible facilities this can be the supports. This can in turn produce a case of misuse (incorrect use) and lead to a potentially hazardous situation. The FRR uses a combination of interfaces, sensors and smart technologies to control the adjustment for the users to their personal preferences. All the designs for the FRR are user-centre based; looking at the users, at what the ergonomic restraints are, and which technologies are accessible to the users (Panek *et al.*, 2005).

Designs for the FRR have been reviewed and evaluated with the users. These reviews and evaluations are used to help the team at TU Delft develop what should be new standards for the design process when designing public conveniences for disabled users (Panek *et al.*, 2005). One of the findings from the FRR project is that there is not one optimal position for the toilet as each person's physical needs are different therefore the FRR has to be a fully adjustable public convenience (Panek *et al.*, 2005).

Japanese toilets

Japan has earned itself an international reputation for outstanding toilets and the use of new technology within the new designs. The Japanese have a mix of squat-type, figure 2.21, and sit-type, figure 2.22, toilets available in public

conveniences (Wei, 2001). Sit down toilets are sometimes perceived as being much cleaner than the squat-type toilets in Japan (Wei, 2001).

Figure 2.21: Japanese squat-type toilet

Figure 2.22: Japanese sit-type electric bidet toilet

Toto™ is a leading sanitaryware design company in Japan they have pushed the development of the bidet toilet. This is a toilet that has inbuilt wash and dry features which are all controlled by the user, the controls are typically on the side of the toilet as shown, figure 2.22. These high-tech toilet seats aim to improve the experience of going to the toilet. They are designed to leave the user feeling clean and to achieve this they have many inbuilt features such as water jets. Some toilets have water jets that have a pulsating massage action to help stimulate the need to defecate; this can help relieve pain of defecating for people who suffer from piles. The water jets also clean and therefore there is no irritation from toilet paper. In Islamic culture and in Muslim countries it is customary to have a shower next to the toilet for use after defecation or urination for use in a very similar way to that of the Japanese bidet toilet. This may also be seen as time consuming, however, these showers are generally much more basic than that of the Japanese sit-type electric toilet.

Japanese's toilets are sometimes accompanied by noise boxes as shown in figure 2.23.

Figure 2.23: Noise box in a Japanese convenience

These are situated in the cubicle and are operated by the user. The noise box emits a sound that is like a flush, this sound covers up sounds produced by the user (Gizmodo, 2005).

2.7.1.2 Squat-type toilet

In the UK, there are not many, if any, public conveniences that have squat-type toilets (figure 2.24) installed in them. They are commonly found in Asia, the Far and Middle East and parts of mainland Europe. Many people are familiar with the concept of squat-type toilet in the UK even if they have not used one. They use the same flushing technology that is commonly used in sit-type toilets. These toilets, although they are not common in the UK are, important to the research.

Figure 2.24: Squat toilet

To use a squat-type toilet the user squats close to the ground and does not rest any part of their buttock or back on any surface. This is seen by some people as a more hygienic way of going to the toilet (Cai and You, 1998). Maintaining a squat position for any length of time could become uncomfortable and difficult for the user to maintain (Kira, 1976) this is important to consider this when designing for the general public as it is necessary to design for all. However, physicians and physiologists agree that the squat position is the most natural posture to encourage defecation (Kira, 1976).

In Taiwan, Cai and You, conducted research into public toilet design. They recorded that 50% of their participants did not sit on a sit-type public toilets. The outcome of the study in Taiwan indicated that there is a movement towards user-centred design and applying ergonomics to the product design of sanitaryware. From implementing this design strategy, which can be omitted by other designers, they were able to find out that for a squat-type toilet it was better for the users comfort to have a slope of 15°. From the study conducted in Taiwan, the participants indicated that 86% of them would prefer public toilets to be squat-type toilets and they would be willing to sacrifice comfort for hygiene (Cai and You, 1998). There are also suggestions that using squat toilets can strengthen the hindquarter muscles and especially for women could in turn help prevent urinary incontinence (Wei, 2001). The reasoning behind the design by Cai and You was to give people greater hygiene and health benefits. It also looked at using users to help design the product, it was the users that gave the direction for the design and they were used to evaluate it at every stage thus leading to a more successful product than was previously available. Although the differences may appear minor, if the design does indeed benefit the user then these minor changes are indeed great assets to the new design.

2.7.1.3   Urinal

Urinals are normally made from vitreous ceramic, figure 2.25, or stainless steel, figure 2.26. Urinals are intended to be used from a standing position and are common in most male only specific public conveniences. The urinal is designed to allow a constant through flow of men as there is, in theory especially with trough urinals, very little need to queue. They are designed for convenience and ease of use.

Figure 2.25: Individual vitreous ceramic urinal

Figure 2.26: Stainless steel trough urinal

Urinals have a reputation for being poorly designed as they often give splash back (Laking, 1998). This can be controlled to some extent by the user; if the angle of the trajectory and the pressure of the urine flow are both adjusted to suit the urinal, however, there are many various shapes of urinal it might be difficult to accurately control flow rate, pressure and the angle of the trajectory for each design. It is best to have the urine trajectory at a shallow angle when it meets the solid urinal surface (Kira, 1976). Unfortunately, splash back might not just affect the user but those on either side of the user; it is for this reason, amongst others, that some men do not use urinals adjacent to ones already in use (Kira, 1976).

Advanced urinals; British designer Malcolm Kimberly has won awards for his design the 'Pistake Urinal', figure 2.27. This urinal is intended to work along with the users' mobile telephone. The idea is that information is sent to the mobile telephone via blue-tooth. The 'Pistake Urinal' is pre-programmed to analyses the users urine sample and to inform them if they have an STI (BBC News World, 2005).

Figure 2.27: Pistake urinal (BBC News World, 2005)

Toto^{TM} has also developed a toilet that can check the blood glucose levels of the users as well as blood pressure, fat percentage and the users' weight. This technology is current and existing (Gizmodo, 2005). The reasoning behind designs such as these is unclear as it is difficult to imagine that a public convenience would be a good place to check your health through urine samples as the devices are used by multiple people sometimes in quick succession and without flushing, so accurate answers might be hard to attain.

Various female urinals; All female urinals appear to be designed to deal with the same problems but look very different. The reasoning behind the design is to provide women with a quick and hygienic alternative to the toilet. This is one of the few places where real innovation has been employed. Currently in the UK and other parts of the world there does not appear to be a movement towards installing these new designs.

The Lady P, designed for a Dutch firm called N.V. Royal Sphinx Gustavsberg by designer Marian Loth, 1998 is shown in figure 2.28.

Figure 2.28: The Lady P (Loth, 2002)

The Lady P is a wall mounted vitreous ceramic female urinal and was introduced to the public in 1999. However, there has been no evidence any of these urinals have been installed in any public conveniences in the UK.

The Lady P could be seen as an alternative design solution to women's urination needs however, it looks similar to a sit-type toilet. The advantage of this design is that it is a visually attractive alternative to the sit-type toilet. The design lends itself to being used in the hover position, many women already use sit-type toilets in public conveniences this way, and this is a flaw of the design. This design appears to have overlooked some use issues and concerns, such as; underwear and trousers, these have the potential to touch the urinal front, there also remains the concern of splash back, as with the sit-type toilet, as well as, women's difficulty to aim from a hover position (Edut, 1999) and maintain balance. It is perhaps for these reasons the Lady P has not had much, if any, success in the UK.

2.7.1.4 Sanitary waste units

Bins are an important feature in public conveniences they are used for paper towels, after hand drying, through to sanitary waste, for used tampon and sanitary pads. Depending upon their use, different disposal units are installed;

- sanitary waste
- nappy incontinence
- paper hand towel

Providing these disposal units essential in public conveniences as the UK Water Industry Act 1991 prohibits *'any matter to interfere with the sewer'* this includes items such as sanitary pads and tampons, therefore it would make sense to provide every toilet with a sanitary waste unit.

Within each category, there are again different designs as there is not a single optimal design. The most obvious and frequently found bin is that of the sanitary waste bin.

Sanitary Waste Bins; Cubicles in female access public conveniences toilets are often, but not always, accompanied by sanitary waste bins. Sanitary waste bins are usually removable boxes placed within the cubicle by the side of the toilet. These are usually non-permanent features and are changed and emptied regularly. Figure 2.29 shows a standard sanitary waste bin that is hand operated by opening the lid at the top of the bin.

Figure 2.29: Sanitary waste bin

Several design issues surround the design of the sanitary waste bins. The bins are intended to be used by a large cross-section of the female society, their purpose is to store used sanitary waste; tampons and towels, awaiting disposal. Sanitary waste bins are disliked by many women and thus lead to women sometimes disposing of sanitary items in the toilet and attempting to flush them away (Levinson, 1999) this can potentially lead to blockages. Sanitary waste bins often take up much of the room between the toilet and the cubicle wall,

figure 2.30, this then does not allow the user much space to manoeuvre or use the toilet. This could be a contributing factor as to why people do not like them.

Figure 2.30: Sanitary waste unit between the toilet and wall

Toilets are not designed to be used as a way of disposing tampons, sanitary towels or any other material other than toilet paper and human waste; however, this misuse of the product appears to be common and must be taken into consideration in the redesign. The sanitary waste bin must also be at fault if it is not desirable to use.

2.7.2 Summary

Designers appear to be concentrating on the same themes rather than tackling the thing that they cannot see directly. It appears that only Kira has looked into the anatomy and how people urinate and defecate. Due to advances in technology, better and more appropriate, designs are more likely to be found rather than the answers Kira discovered when his book was published in 1976. Human anatomy has not changed greatly since then. Kira's book, and data within it, is presumed to have been written for an American market so there might be some differences between the data in 'The Bathroom' to the data needed for a UK population.

2.8 User-product interaction

Products are often used as a way of defining the user and have been described as a means of expressing an individual's social statuses (McDonagh, Bruseberg and Haslam, 2002). Indeed researchers, such as Dittmar (1992), express the view that the products, or positions, that people own on a personal level also represent the social groups that people belong or adhere to. Therefore can be suggested, that products provided for public use, can define the community that uses them.

Identifying which key elements are important to the users, in terms of; product use and product identity, are essential in developing a successful product that is fit for purpose and expresses aspirations; i.e. hygiene, usability, amongst others, of the community they are in. In other areas of design, it has been identified that consumers are interested in more than the basic functional values and place value on other aspects of the usability (Burns and Evans, 2000). One way to encourage the success of this is to employ design methods such as 'user-centred design' (UCD). User-centred design, human-centred design and customer-centric design, are all effectively different terms for the same approach to designing (Veryzer and Borja de Mozota, 2005).

Unlike the user-product relationships, that relating to personal choice, the products of interest in this thesis are for public use. Therefore, there is only a small chance that the users of the products are consulted on the choice supplied for them. These decisions are most likely made by other stakeholders, who may also be users, but are likely to be the providers; either funding or maintenance. Therefore, when considering the user-product relationships with these specific products it is not necessarily possible to use the term "*symbolic consumption*" (McDonagh, Bruseberg and Haslam, 2002: p231) as they are not personally purchased products. However, it is possible to project the image and aspirations of the public through these types of products, therefore allowing them to have quasi-language (McDonagh, Bruseberg and Haslam, 2002) to communicate with other user groups be that tourists from different countries or from within the UK.

2.8.1 User-centred design

For effective user-centred design, users need to be involved with the design process throughout the development of the project and product, as "Empathizing with user needs provides vital information for designer" (Bruseberg and McDonagh-Philp, 2001: p438). However, it is not just the users that need to be involved with the design process from the beginning, but industrial product designers should also be involved (McDonagh, Bruseberg and Haslam, 2002). This means the designer should also be involved with designing and execution of data collection and analysis. Design is an important part of product generation and development. However, design is sometimes only brought into product development at one or a few of several different stages such as; generating the brief, initial concept development, product design; in terms of inclusivity and aesthetics (Veryzer and Borja de Mozota, 2005). Design and designers are also sometimes thought of as an 'add on' to an already developed product (Veryzer and Borja de Mozota, 2005). Design, if employed through the process, can lead to solutions that are more progressive. Indeed, companies such as IDEO™ already employ this strategy and have design running through their industrial design, engineering and research teams (Veryzer and Borja de Mozota, 2005). This allows the process to be exposed to all the factors that affect the design but also allows the designer to understand the needs of the users from each perspective. The ergonomics of the anthropometrics, as well as the emotional response people have with products, should be seen as equally important in the product development stages of the design process, as this helps with the transfer of knowledge being directly employed by the designers in the design process (McDonagh, Bruseberg and Haslam, 2002). Lockton (2006) says that this 'user experience' is important as; in general, the aim of product design is to enhance user-product relationships.

2.8.1.1   Measures of people

Very often designers rely on measures to make decisions in design. When designing for human interaction these measures are often of anthropometric data taken from trusted sources. Three such publications produced by the University of Nottingham and the Department of Trade and Industry (DTI) are *Childata* (Norris and Wilson, 1999), *Adultdata* (Peebles and Norris, 1998) and *Olderdata* (Smith, Norris and Peebles, 2000). Designers and industry often refer

to this type of data because it is easier to quantify numeric data. Chapanis (1988: p261) observed this practice and wrote "*All too often dependent variables are picked because they are easy to measure, because instruments or devices for measuring them are available, because the investigator or other people have used them, or simply because they are most likely to yield statistically significant results*". However, these publications are reliant on other publications for the anthropometrical data such as in Childata that uses Pheasant's ratio scaling method from stature data measurements collected in 1970 – 1971 (Department of Education and Science, 1972). As such, the validity and relevance of the data has come into question due to its 'age' (Smith and Norris, 2004).

This form of practice is important but ideally should be coupled with less tangible but equally important issues, such as, the users' emotions. However, products, often being used by consumers, are more than just a physical object; they evoke an emotional response from the user. This is evident in everyday life when people have 'favourites' or name inanimate objects. People do have emotional responses to items and these can be for a variety of reasons (Kanis, 1997). These issues are not so readily available in textbooks or journal papers, so are sometimes overlooked in the design process.

The ergonomic data, which relates to human activities, sometimes does not produce clearly defined boundaries. As such, it can be difficult for designers to comprehend, thus leading them to use more scientific data to guide the design (Kanis, 1997). Understanding the process of product use and its reasons, can lead to heightened design outcomes (Kanis, 1997). Industrial design offers solutions in a competitive market where cost and value are measured (Veryzer and Borja de Mozota, 2005). This area of design should not be overlooked, as it is here that the real value of a product can lie, thus the ultimate success of the product within the market.

2.8.1.2   Benefits of user-centred design

With increased frequency, UCD is being employed as a tool in the design process (McDonagh, Bruseberg and Haslam, 2002); increasingly consumers are viewed as not only buyers but also users. If products were designed to suit the needs of the users and answer their problems, then the solution is more successful leading to greater results.

Designers' need to have a better comprehension of the needs of the users to work on a solution for their needs rather than one based on the designers' and their experiences and bias. The resulting designs may not be revolutionary but will improve upon existing design solutions. Alben (1996) has created two categories for the design criteria. Firstly, 'in use experience' by the consumer and secondly, 'the design process' and its affect on the user. The latter has two subdivisions; comprehension of the intended users and assessment of product success due to effective interaction design (Alben, 1996).

The basis of the criteria is one that is practiced here at Loughborough University, especially in the Undergraduate degree of Industrial and Product Design Technology. Students are taught to identify three criteria. They are;

- **user**; gender, age, employment etc...
- **task**; aid, solve, confuse etc...
- **environment**; indoors, outdoors, underwater etc...

These three elements are the basis for understanding the users. They are similar to those set out by Alben; needs, task and environment. It is understood that 'needs' could also be addressed through the identification of the 'user'.

Amongst these criteria set out above; user, task, environment. There are other aspects to consider when employing interaction design. For the purpose of this study, three are particularly appropriate (Alben, 1996);

- **need**; do the products answer the consumer needs?
- **appropriateness**; do the products answer the customer needs at the appropriate level?
- **mutable**; are the products adaptable to suits the needs of different user groups?

These three elements and questions are paramount in the design process in order to create inclusive and effective design interaction, especially with public use products. Norman (2005: p92-p93) says, *"to the practitioner of human-centred design, serving customers means relieving them of frustration, of confusion of a sense of helplessness"*.

2.8.2 Product design in relation to user-centred design

Research and development are important to clearly define and execute with any UCD project. Industrial design is described as *"the professional service of*

creating and developing concepts and specifications that optimize the function, value and appearance of the products system for the mutual benefit of both the user and the manufacturer" (Veryzer and Borja de Mozota, 2005: p130). However, the International Council of Societies of Industrial Design (ICSID) have a different definition, it being *"design is a creative activity whose aim is to establish the multi-faceted qualities of objects, processes, services and their systems in the whole life cycle. Therefore design is the central factor of innovative humanization of technologies and the crucial factor of cultural economic change"* (Veryzer and Borja de Mozota, 2005: p130). For the purpose of this study, both definitions are important to consider, however, the ICSID's definition is more relevant.

2.8.2.1   Designing for user acceptance

When designing products, their success is based on how well the product is accepted by the intended users. The products presented and investigated in this thesis are primarily functional products that rely on human interaction. However, the relationship with the products is not just physical but can be emotional. The products should be functional, as ultimately each product aims to satisfy a physical need, but they should go beyond this primary stage and engage the users, this maybe to make them feel or act a certain way, but should involve reducing, if not eliminating, the feelings of fear and rejection some people presently have towards these products.

McDonagh, Bruseberg and Haslam (2002) said that the emotional amongst other less tangible needs, affect user-product relationships. Understanding the users is essential in creating an effective design. Understanding who they are, their needs and their qualities. The last attribute can be difficult to ascertain when designing for a large user group however, the first two attributes are inexcusably essential to understand. It is also essential to understand and work with the users pre-existing knowledge and experiences (Kanis, 1997).

Diversity: The UK is made up of many different identities; the Office of National Statistics (ONS) identifies these in four groups (ONS, 2009);

- ethnicity
- national identity
- religion
- sexual identity

A graphical representation of the different ethnic, national and religious backgrounds are presented in figure 2.31 which show a recent representation of the population of Great Britain.

Population of Great Britain: by religious affiliation, April 2001
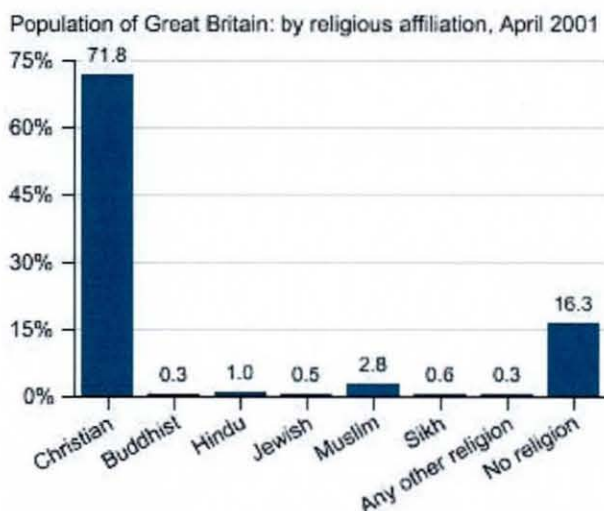
Figure 2.31: Religious affiliations GB (ONS, 2009)

However, regardless of our ethnic, national identity and religious affiliation we are all presented with the same products to use in public conveniences. It should be viewed that these variations, offered by exploring ethnographic differences, as well as, other external factors should not be seen to be deductive to the design processes and the final design, but as an opportunity to encourage innovation resulting in a positive design outcome better suited for the intended users.

2.8.3 Designing to guide users

User-centred design is a beneficial process as it offers the users as the guide for the design. However, with multiuser products, especially products of this nature, is also important to consider guiding the users as to correct or intended product use. The challenge with user-centred design is to create a system, or design, that integrates existing consumer knowledge of use patterns and needs (Veryzer and Borja de Mozota, 2005). By involving the users in the design process and focusing the design around them, the knowledge that was previously lacking; in terms of the relationships people have with product as well as other less tangible aspects, can be investigated and then understood therefore removing or lessening this knowledge barrier (Veryzer and Borja de Mozota, 2005). By the introduction of these less tangible aspects, which were

previously unavailable, a more holistic and consequently 'higher level' design solution may be sought (Veryzer and Borja de Mozota, 2005). As with any product, for it to be successful, it must be accepted by the audience for which it is intended (Veryzer and Borja de Mozota, 2005).

Designs that rely on existing models need to draw on the familiar and improve on faults whist generally improving the ease of use to gain acceptance of the 'new' product (Veryzer and Borja de Mozota, 2005). This is important in two ways; discourages misuse and encourages more users to use the product. Whereas personal items might be designed to allow for adaptation this is not necessarily a practical or desired outcome for public convenience sanitaryware products. However, the designer must be mindful not to alienate the user by constraining the item to vigorously (Lockton, 2006). Acceptability of products has to be achieved on several levels. Over engineering products can lead to confusion and then render aspects of the product futile (Kanis, 1997). Instructions on how to use the product should be clear. Lockton (2006) has called this act of guiding users 'architectures of control' and has defined it as;

"features, structures or methods of operation designed into any planned system with which a user interacts, which are intended to enforce or restrict certain behaviour" (Lockton, 2006: p28)

It is important to give guidance through the design of the product and encourage proper use, i.e. urinals are designed in a certain way to encourage urination from a standing position facing the urinal by men. It has not been designed to encourage women to do the same, nor has it been designed to encourage defecation or using it facing outwards. Its design itself is an architect of control and one that is easy to comprehend. The design is then seen as successful if it is used in the intended way, this then prevents future failure should the product have been misused (Norman, 2005).

Product usage is difficult in certain circumstances to predict accurately and actual user-product interaction can differ from perceived user-product interaction (Kanis, 1997). The differences in the 'actual' and 'perceived' may be due to a number of external factors; physical ability of the user, understanding of the design intention, gender, age, religion to mention a few. Ethnography is certainly essential to consider when designing any product intended to be used by people from different cultures.

Instructions on how to use the product should be clear. Instructions do not necessarily need to be written, but can rely on pre-existing knowledge. People

generally know to press a button or turn a tap; designers should work with these pre-existing principals to aid users in understanding the design. If not then false negatives maybe the result due to users incorrectly interpreting the instruction or the design. Effective design can elevate this and even with potentially misleading instruction, correct usage can be obtained through effective design (Kanis, 1997).

2.8.3.1   Architects of control

There is, in the built environment, a need to control, or guide, user behaviour. Lockton (2006) discuss how the technique of architectural control can induce good behaviour by reducing misuse. He gives the examples of bus stop seating being slightly uncomfortable to reduce the number of people who sit there for long periods of time or introducing raised bolts into pavements to prevent skateboarding.

Kanis (1997) has also made some simple studies of people using 'every day products' one was of a single portion of milk. Kanis (1997) observed that with one simple design, six variants were observed with only two producing the correct usage of the design as intended by the designer, figure 2.32.
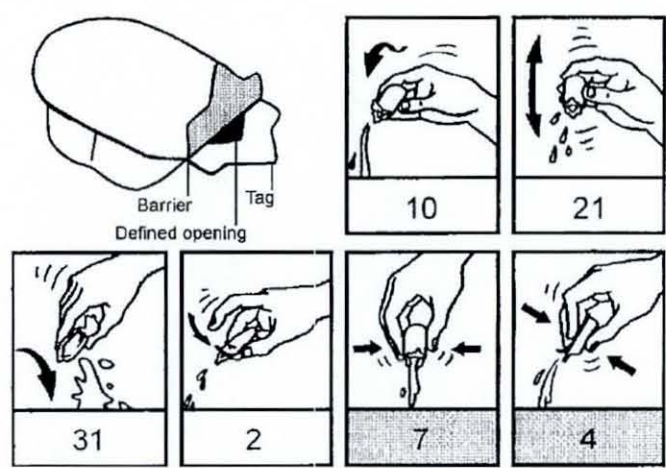
Figure 2.32: Observation of milk portion use (Kanis, 1997)

By employing effective architectural controls, as well as, understanding the users' backgrounds the milk portion container may have been designed to guide the user into using it differently.

2.8.4 Summary

Through the employment of user-centred design, products will be designed from the concept to delivery with the user as the focus. For this to be achieved successfully it is advised that product designers are included in every step of the product development.

Designing products around already established or identified user needs will not only facilitate the outcome of the design being successful for the user but may also aid the designer in creating a product that will guide the user into correct product usage through the employment of architectural controls.

User-centred design, used in conjunction with architectural controls, are not meant to be a way of constraining the user but a way of removing any ambiguity of the design. Clear communication should also be considered and this communication can be done through the design of the product lending itself to being 'easy' to read.

2.9 Conclusion

Conducting and researching information in order to write this literature review proved invaluable in compiling current and relevant material on sanitaryware design. It was then possible to see where there were gaps in the research and where it may be possible to focus future research.

There is an abundance of information about public conveniences within the built environment; there is also work being conducted concerning disabled access to facilities. From a product design perspective, this gives great scope for innovation, as there appears little information available on the pure product design of sanitaryware.

Product design of sanitaryware does not appear to have progressed greatly in the last 200 years (Laking, 1998). Kira appears to have performed the only research to date that attempts to make a study of how users use toilets, but he has not investigated the effects of sanitaryware upon the users either physiologically or psychologically.

Through investigating the literature, it has become clear that there is only really one type of toilet provided for men and women in the UK and that is of the sit-type toilet. Men are given the option of a urinal in most public conveniences but it does seem that there is a distinct lack of user-centred design.

Both genders, although they need to perform the same basic task, are different physically both externally and internally this needs to be carefully considered in any future design work. It is not just necessary to understand the physiology of the users but also what it is that they want in order to design a product that will answer the users' needs and meet their demands.

There are many variations in toilet conception and manufacture, but there appears to be a distinct lack of design separation between what is, a design for the home and, what is a design for public use within public conveniences. User-centred design must be considered at every stage of the research as the products are intended for the users; however, the product produced from this thesis will be aimed at designers. Because the guidelines are aimed at designers and the information needs to be accessible to them.

CHAPTER 3: RESEARCH METHODOLOGY

This chapter explains the research methodologies employed for this project. At the start of every project, the most appropriate research methods must be identified. Designing an appropriate methodology ensures the success of the research. The methodologies should also be mindful to the experiences of the researcher but also must be appropriate to the audience and the task (Creswell, 2009). To complete this research project several research methods have been explored and employed. There are three common types of research methods; qualitative, quantitative and mixed-methods (Creswell, 2009).

3.1 Quantitative, qualitative and mixed-methods approaches

A mixed-methods approach to data collection was employed through the study, as described by Newman and Benz, (1998) these methods were not seen as separate paradigms, but were used together to support the collections of the data thought the study. It is possible to view qualitative data and methodologies as more 'rigorous' than quantitative data and methodologies. This is because it is as it is possible to measure, quantify and test variables (Carson, 2001), there are arguments, as presented by Alam that qualitative methodologies, such as interviews are of equal importance and are essential in developing theories for new product development, especially in the marketing sector (Alam, 2005).

It was necessary, as with all research, to identify the areas of interest, to elicit the correct information without bias, or to waste the time of the participants. Depending on the aim of the study and the appropriateness of each method, sometimes more emphasis has been made on one type of methodology; however they were not ever treated, or seen, as mutually exclusive.

Independent use of quantitative and qualitative methodologies has benefits and limitations depending on the task, the mixed-methods approach employed in this study aimed to increase the benefits and reduce the limitations. However, as with all methodologies there are constraints and restrictions (Creswell, 2009). Since the early 1990s a mixed-methods approach to research has emerged. Methods; quantitative and qualitative, are used in conjunction with each other to help identify areas that can be best explored with the other

approach (Tashakkori and Teddle, 1998). It is essential to design the correct methodology to ensure a successful investigation. Planning the methodology helps to keep a focus on the research question and the target audience, for whom this research is intended. As the research was reliant on user participation, it was also important to recruit participants and inform them of the research they would be taking part in. As the subject area was deemed 'sensitive', it was also important to build a level of trust. The success of this research was based on two attributes;

- **planning;** of the study's and structure of the research
- **trust;** of the researcher and of the participants

3.1.1 Planning

Planning the research and the investigations was essential in ensuring the success of the project. Limited time, three years funded, was made available for the researcher. Therefore, it was necessary to encourage participation by understanding the requirements of the project.

Planning allowed there to be a transfer of information between the researcher and the participants, this helped gain a level of trust.

3.1.2 Trust

In order to gain the trust of the participants it was necessary to inform them of the research and to plan efficiently. This was done through several different mediums. However, the main one was an online website 'www.toilet-talk.co.uk'. This website was designed by the researcher and hosted during years one to three of the study. It was used to communicate with everybody who wanted to ascertain the validity of the research but also to act as a way of advertising the research and explaining its purpose.

Trust was also gained by keeping the focus of the researcher on the project. The definition of design was used to keep this focus; *"design is a creative activity whose aim is to establish the multi-faceted qualities of objects, processes, services and their systems in the whole like cycle. Therefore design is the central factor of innovative humanization of technologies and the crucial factor of cultural economic change."* (Veryzer and Borja de Mozota, 2005: p130)

Design, is not wholly restricted to products and it was understood that design is influential on and influenced by systems.

3.2 Research purpose

It was the intention of this research project to investigate a social concern; what are the users-product relationships with LA public convenience sanitaryware products in the UK and how, through effective design, can the needs of the users' be met?

This question gave the research clear definition as a 'user-centred' design exercise. It was clear in the developing stages of the research that engaging with users was essential to the success of the project. Firstly, it was necessary to establish a plan of action to answer the research question. The primary method was to conduct an extensive literature review (Chapter 2). This highlighted many areas that had previously been researched and through this it was possible to see the areas that had not been considered, thus confirming one of the research objectives, 'to contribute to new knowledge'.

3.2.1 Creating a research strategy

Throughout this study, a concurrent mixed-methods approach was employed (Creswell, 2009). Each study, although independent, in as much as they were not conducted at the same time and needed to be complete for the next one to commence, was part of creating a solution for the project aims and fulfilling the objectives. Some methodologies were more reliant on quantitative data and subsequent studies on qualitative data.

Following the literature review, an initial exploratory study was designed (Chapter 4) and executed to test the appropriateness of certain data collection techniques and to educate the researcher in data collection itself. It was also necessary to explore different research techniques and to apply the most appropriate to the task. Conducting an exploratory study also tested the appropriateness of using online data collection techniques for this study. It was not possible, prior to completion of the literature review, to decide the most appropriate area to study. However, it was evident that online data collection would be employed in this research as it involved participation from the whole of the UK. As neither funding, nor time, permitted large scale studies to be

conducted in different locations across the UK, it was felt that the internet would serve as a good medium for attracting participation from a geographically and culturally diverse cross-section of the UK population.

3.3 Planning the exploratory study

The results from the initial exploratory study allowed a general overview of the relationship people had with all types of 'away from home' public conveniences to be explored. Some of the user trends were identified, trends of user differences and similarities between men and women. The results also confirmed that the sit-type toilet was the only style of toilet available to women; men had urinals and sit-type toilets. Women tended to hover rather than sit on the toilet to urinate and men tended to use a urinal. Emotional relationships with the products were similar with both user groups and it was established that neither men nor women were happy with the designs presented to them in 'away from home' public conveniences.

3.3.1 Methodology

In order to achieve the aim and objectives for this study, two mediums of data collection were used; an online survey which used two methods of data collection; qualitative and quantitative to collect information and informal conversations conducted during the time of the survey.

3.3.2 Online survey

For the purposes of this initial exploratory study, information was gathered electronically, through the employment of the internet, from the UK public. The survey was intended to be answered only by people currently residing in the UK and by ages 18 to 65 years. Separate male and female questionnaires were formulated and presented accordingly, depending on the data input by the participants; these can be found in Appendix 1.

Participants were recruited to take part in the survey through an email letter. Recipients were also asked to forward on the link to the survey, along with the email letter to other people whom they thought might wish to take part in the

research. All replies to the survey, which fulfilled the user group requirements, were recorded under a participant number, this was to ensure anonymity.

The initial exploratory study was not concerned with which specific type of 'away from home' public convenience was used. At this stage it was unclear if the research would concentrate on all 'away from home' public conveniences available for use by the public; including those in restaurants, bars and places of work, amongst others, or just specifically LA provided public conveniences.

The surveys were written in several sections, each concerned with a different aspect of public convenience usage. The break-down of the sections within the surveys are described below;

About you: this section was aimed at identifying the participants' physical size. This was asked in order to facilitate and understand whether body size had any bearing upon the usability of all 'away from home' public conveniences. It also served to identify which participants, if any, might have duplicated questionnaires.

Disabilities and accessibility issues: this section established who, if any, of the participants had a disability. Questions also focused upon where the participant thought they used all 'away from home' public conveniences most frequently and asked them what their general perceptions and feelings were toward all 'away from home' public conveniences.

The following sections were worded so that the participants would answer the questions in relation to the last three 'away from home' public conveniences they had used and/or visited.

The facility selection: for this survey it was necessary to establish where the last three visits to 'away from home' public conveniences had been made, what type of facility had been used and for what it had been used. It was important to establish this information at the beginning as it gave an indication to the availability and possible product choice the participant was offered. It also offered the best way of identifying each type of facility.

The surroundings: this section was used to establish what the physical surroundings of the 'away from home' public conveniences in order to understand what the experience had been like for the participants.

Cleanliness: This section was intended to find out what the participant's experience of the 'away from home' public conveniences had been in relation to hygiene.

Use: It was essential to see what the facilities were used for and how they were used. This was to identify potential user patterns between, and within, the male and female user groups.

Toilet paper: identification of user patterns emerging from the use of toilet paper were important to identify when considering any revision of a design.

Hand washing: this section was used to identify who washed their hands and what the differences or similarities were between male and female habits.

3.3.3 Informal conversations

Whilst the online survey was running, informal conversations discussing the subject of sanitaryware; its design, its use and the emotional effect it has upon them as users, were conducted.

Informal conversations were used to support the research gathered through the questionnaires. They also acted as research practice for future interviews, this proved extremely valuable when talking about sensitive subject matters such as public convenience usage in future studies; the background knowledge of how to handle these conversations was already established.

Some of the results from this initial exploratory study were misleading as they were concerned with the last three 'away from home' conveniences visits made by the participants. This ambiguity was successfully identified and removed from future research. The informal conversations were also concerned with the public's general perceptions towards all 'away from home' public conveniences rather than specifically the last three they had visited. It was then decided that future research would focus on LA UK public convenience sanitaryware products to remove this ambiguity.

3.4 Planning the online and on-street study

Following the literature review (Chapter 2), and initial exploratory survey (Chapter 4), a subsequent study was designed and conducted (Chapter 5). An online and on-street study was hosted for data collection.

3.4.1 Methodology

After completing the pilot study, it became clear that the method for collecting the data was biased towards the 20 to 29 year old age group as they accounted for 51% of the participants. To ensure that the views of the entire UK public were represented, and the results were not biased towards one particular group, the main study included an online survey where the female and male survey were hosted online, as well as being supported by an on-street survey.

3.4.2 The survey

The main study was presented to participants in three sections. Each section aimed to establish the users' responses to specific LA provided public convenience sanitaryware products.

Section one: This section was about toilets. This was identical for male and female participants.

Section two: In the survey intended for male participants, was about urinals, and in the survey for female participants was about sanitary waste units.

Section three: Personal information about the participants was collected. This was the same for male and female participants.

Participants were asked to rate their responses to statements in sections one and two of the survey using the Likert scale, below;

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable

Additionally, in each section participants were asked to choose characteristics that they felt were important to the specific products. Each of the first two sections gave participants the opportunity to write any comments, suggestions and/or observations they had about the products. The content of each of these sections is discussed in Chapter 4. Although the approach for this research was mainly quantitative, a mixed-method approach was employed to give a more holistic set of results, see Appendix 2 for an example of the survey questions and results.

3.4.3 Online survey

Although there are associated limitations with online data collection, the method had proved effective in the initial exploratory study as it facilitated quick, unobtrusive and cost effective data collection. Due to the success of this study, an online survey was reused as a tool for the data collection in the pilot study and main study, which was also conducted alongside an on-street survey.

All participants were self-selected volunteers recruited via email or through internet forums between August 2006 and January 2007. Participants were asked, as with the initial pilot survey, to forward the information to other people who they felt might like to take part.

3.4.4 On-street survey

The on-street version of the survey contained the same questions and statements as in the online version with one exception; participants were not asked if they were in the UK at the time. This question was unnecessary due to the on-street survey being conducted in the UK.

An advantage of the on-street survey was that the researcher was present to answer any queries participants had with the survey. There was little confusion with the on-street survey; all of the surveys, apart from two, which have been removed from the results before being analysed, were completed correctly. The two that were removed were because the participants had not completed the questionnaire. There was one query from a male participant who believed a section had been repeated, the sections in question were; *"From a public **toilet** I require..."* and *"From a **urinal** I require..."* It was possible to quickly answer this query and clarify any confusion; it appeared the confusion was because the participant had not correctly read the question.

By creating an on-street survey, people who did not have internet access or who were unable to read for various reasons, were able to take part. The researcher on three occasions read aloud the survey to participants and filled them in on their behalf. The on-street version of the survey had one major disadvantage for participants; it did not allow them complete anonymity. Because of this, a 'post box' was made so completed surveys could be submitted anonymously.

3.4.4.1 The toilet

The users' needs and expectations of toilets were investigated in this section; male and female participants were asked to respond to fourteen themed statements. Two of the statements in the first section of the main study were different to make them gender appropriate. There were seven themes in this section, each presented in two statements. These themes were;

- availability
- privacy issues
- product use
- perceptions and expectations
- hygiene
- usability
- emotional effect

3.4.4.2 The urinal

This section investigated male users' expectations and needs from urinals. The statements in this section concentrated upon three themes;

- physical use
- product preference
- privacy issues

3.4.4.3 The sanitary waste unit

This section aimed to identify female users' expectations and needs from sanitary waste units. The statements in this section concentrated upon two themes;

- physical user
- emotional effect

3.4.4.4 Emotional impact and about you

In this section, participants were asked their age, if they had a disability and if so what their disability was, and their religious beliefs. The religion of participants was considered important because certain religions give guidance

on toilet use. In addition, in the online survey they were asked if they were, or, were not in the UK at the time of answering the survey; the on-street version did not require this information. Participants were also given the option of submitting their email address in order to be contacted about future research.

3.5 Planning person-to-person interviews

Following the main study (Chapter 5) person-to-person interviews were conducted (Chapter 6). The participants were again self-selected and this was done through inviting people, who had previously submitted their email addresses, to take part in this study. Participants who responded were selected depending upon proximity to Loughborough or Coventry, these were places the interviewer could get to with ease and also kept costs down.

3.5.1 Aim and objectives

This study was aimed at eliciting exact information to comprehensively understand UK users' specific needs from public convenience sanitaryware products; toilets, urinals and sanitary waste units. The desired outcome was to create a set of guidelines with the intention that product designers would use them to produce designs that answer the users' needs and to expand upon existing knowledge of the users' expectations of specific public convenience sanitaryware products. Following two successful studies there was a foundation upon which to base the interview questions and to give the study direction. However, the initial two studies had involved impersonal questionnaires and had provided a very monochromatic outlook on the subject. It was now necessary to gather detailed and more specific information to comprehend the requirements of the target users. For this reason, it was necessary to investigate the target users' specific requirements in more detail, for the identified products, to understand and identify the weightings of these findings.

From this information the objectives were;
- to quantify the findings from the previous studies
- to test the results of the findings against a smaller user group of people in the UK
- to create a set of guidelines designers can work with when designing future products

- to create and validate a set of design guidelines for use by designers when designing future products

3.5.2 Methodology

During 2006 and 2007, a pilot study and main study were performed upon which the main emphasis of the structure of this study was based. It was observed that the subject would require further in-depth investigation. It was decided person-to-person interviewing was an appropriate base methodology for this phase of the research.

3.5.3 Structuring the interview sections

Although it was possible to determine from the initial studies some of the users' needs and expectations of the specific public convenience sanitaryware products, it had not possible to determine what these attributed to in detail. At the time of this initial research it was not possible to establish what information was required from the interviews. As a consequence it was necessary to run the questionnaire surveys to provide the baseline upon which future research was able to be built.

3.5.4 Employing qualitative rather than quantitative research methods

Both qualitative and quantitative data can be collected through the employment of interviews. However, the most appropriate methodology for this phase of the research was to use qualitative, rather than quantitative, research techniques. All previous studies had used a mixed-methods approach and proved successful. The previous studies had mainly relied on quantitative data collection techniques; this did not provide any in-depth qualitative data analysis.

3.5.4.1 The interview methodology

To gather the necessary and relevant information, it was important to adopt appropriate methodologies for the task. As previously discussed the

methodologies chosen for the previous studies, although successful, did provide a very monochromatic overview of the subject area. It was therefore decided qualitative methods would be employed. This sequential mixed-methods approach to the whole project has been paramount to its success.

It was essential, when undertaking the person-to-person interviews, to maintain a high level of professionalism, particularly in cases where the subject is focused on discussing private and personal matters. Public convenience sanitaryware product usage is one of these areas and has an element of embarrassment associated with it. This made the development of a trusting relationship between the interviewer and participant important to establish, and maintain throughout the interview process from recruiting the participants to maintaining their trust and collaboration when analysing and producing the results.

Pilot studies were conducted, to identify and remove potential obstacles, to ensure the interview was ethical, as well as, test the interview protocol. Ethical clearance was sought through the Ethical Advisory Committee at Loughborough University for this study, as with all studies.

Whilst conducting the interview it was also important to consider the user reactions both at the time of the interview and retrospectively when analysing the data. The user's reactions provided an insight into the interviewee's emotions; this is something that was not possible to gather through impersonal online and on-street surveys. When conducting person-to-person interviews it is possible to make observations of people's unspoken reactions and to identify these body language reactions with user's spoken responses. People use words as 'symbols', these 'symbols' later needed to be analysed in accordance to the context of the conversation, where possible to body language, tone and voice (Mostyn, 1985).

There were, as with many research methods, several ways to conduct interviews. The structure of the interview had to be mindful of the participating audience and their ability to adapt to its approach. Men and women, as proved through conducting and analysing the pilot and main study, wanted to discuss different aspects of the design of the specific public convenience sanitaryware products; the different items of sanitaryware also evoked different responses from the participants and this was dependent upon the gender of the participant. The interview was designed to accommodate these factors.

The interviews followed a semi-structured guide of pre-determined questions and themes for discussion (Appendix 3). This methodology then allowed the interviewer to adapt the interview and change the order of the questions accordingly, depending upon the individual being interviewed. By using this method the interview then became both retrospective and prospective. Questions were posed at different times during the interview when deemed appropriate during the conversation. The questions were designed to encourage participants to reflect upon existing designs, but also tried to encourage them to propose their ideas about how to improve the existing products or create new designs to fulfil their user requirements.

As stated previously, the interview followed a semi-structured format. It was however necessary to define the areas of interest and set the boundaries of those respective areas. This was to ensure that all relevant areas of interest were covered. The interview used words; spoken and written, along with diagrams and pictures. Through the use of these different media, both the interviewer and the participant were allowed to explore the subject without being limited by spoken words alone (Douglas, 2002). The interview was recorded audibly by using a digital voice recorder. This, together with the use of photographs, has facilitated the gathering of detailed data that allowed for a greater comprehension of the data gathered and facilitated the interviewer to concentrate on the flow of the interview rather than continually making detailed notes. Notes were also taken during the interviews and were later referred to for clarification, if necessary, when transcribing and analysing the interviews.

3.5.4.2   Funding

No funding was available for the interviews, due to this, it was necessary to encourage people to take part by making the process as transparent as achievable and by encouraging participation by informing as many potential participants as possible. To allow for transparency, the procedure for the interview was explained along with some of the aims and objectives of the research. It was important to inform potential participants of the interview procedure without disclosing too much information, as this could have led to the participants forming prejudged biased opinions (Oishi, 2003). The pre-letter emails were personalised and not sent as a group email, this was intended to encourage a higher response rate from potential participants. Although this could not be measured given the sample size and the lack of a control group,

however, the required number of participants was reached without any difficulty.

3.5.4.3 The participants

The interviews involved members of the UK public aged 18 years old and over. Participation from under 18s and over 65s was not specifically sought. However, the interviews considered the needs of carers; people who have a duty of care for another person; children, adults and the people for whom they care and older people.

Fortunately, for this research, 180 potential participants had already given consent to be contacted about future research by adding their email addresses at the end of the online or on-street surveys or through contacting the researcher directly. These potential participants received a 'pre-letter email' inviting them to take part in the interview (Appendix 4). The pre-letter email contained information about the interview and explained how their email address had been obtained. It was advantageous to have this bank of potential participants because permission had already been obtained from them to contact them, and by volunteering the information of their contact email, it was felt that there was already an achieved level of trust between themselves and the interviewer.

The pre-letter email was intended to allow people to choose whether or not to take part prior to the interview. It was favourable to have participants withdraw after the pre-letter email had been sent out, rather than them withdrawing from the study after arrangements were made to interview them, or after the interview. Participants who wished to take part were asked to respond via email or telephone. In this way, it was felt that people who chose to participate in the research appreciated that they would be prepared to participate in the previously aforementioned tasks. However, participants were informed of their right to withdraw from the study at any point, without need for any explanation; this was made clear to the participants at several stages of the study.

3.5.4.4   Selecting participants

Because public convenience sanitaryware products are items most people are familiar with, and as a consequence there is a large target user group, it was essential to ensure that the people who did participate in the research were from a representative group of the UK and not from any one particular group that could bias the results of the study. When the potential participants indicated their intention to be interviewed; they were asked to provide information to categorise them. The same attributes, which were used to categorise people for interview selection, were also the same as those used on the previous studies; gender, age and religious allegiance (Brenner, 1985). Should several people have provided similar backgrounds, a selection would be made on the basis of proximity to the research base, Loughborough University, as well as other 'easy to reach' locations across the UK for the researcher. As such participants were also interviewed away from the University in towns and cities across the UK these included; Coventry, Rugby, Barnsley and London. In all, twelve people were selected for the interview, six men and six women.

Following the acceptance to take part in the research, participants received a second email or telephone call to confirm if they had been successful in the selection process. Unsuccessful candidates received an email that explained that they had not been selected, at that time, to take part in the research.

3.5.4.5   Constructing the interview

It was important, when gathering the data, that the correct information was sought in an appropriate manner. To achieve this it was necessary to understand the target audience. It was also important when conducting the interview that the participants were not just made to feel at ease, but also that they understood the process and the questions that were being posed to them. Oshi (2003) has a checklist that has identified four rules for wording questions in interviews, specifically when asking open ended questions, to elicit explanations from the interviewee, as opposed to the 'yes or no' answers that would be provided in response to closed questions;

- use appropriate language for the target audience
- keep the language/wording neutral
- only ask about one aspect per question

- provide respondents with enough information in the questions so they are able to answer accurately and meaningfully (to avoid 'I do not know')

These four rules were adopted when the interview questions were formulated.

3.5.5 Mixed-methods elicitation

Person-to-person interviews are often advantageous as they can allow the interviewer to use visual aids as a means of communication (Oishi, 2003). This facilitates the researcher into not having to rely on the participant fully or only understanding the wording of the question; the use of visual aids can also help reduce or even remove language barriers imposed by the employment of words alone. Crilly *et al* (2006: p342) suggest that conducting interviews with diagrams can be particularly useful where there are "*cross-cultural language barriers*". Consequently, a mixed-methods approach to eliciting the required information from the interviewee was used as a way of providing the researcher and the interviewee with a means of eliciting the correct information. Another advantage of using images in the interview was that the human brain, through its evolution, developed the understanding of visual imagery before language. Consequently, this can encourage the participants to understand the process better than if words alone were used (Douglas, 2002). In a study performed by Collier (1957) it was found the use of photographs also focused the interviewee's attention and reduced any ambiguity during the interview. This initiative is supported by other researchers who write that the use of graphics in elicitation "*may encourage contributions from interviewees which are difficult to obtain by other means*" (Crilly, Blackwell and Clarkson, 2006: p350). It was important to gather as much relevant information as possible in a very short time. Images also "*stimulate and release emotional statements about the informant's life*" (Collier, 1957: p858). It is for these reasons; it is believed a mixed-methods approach to the interview would be the most appropriate for this study.

To achieve this, it was necessary to employ the appropriate mediums. For this research words; spoken and written, along with images; line diagrams, were used and converted into the artefacts to be used in the interviews. The artefacts were used during the interviews to create scenarios of the product usage and user-product relationships. It is believed, by researchers, such as Blackwell (1996), which the use of visual language offers benefits that cannot be provided

by textual language alone. It was also hoped that the employment of the artefacts would provide clear boundaries to the participant about the area of interest for the research. Using this approach, it was envisaged that information, which may possibly have been overlooked or unobtainable through the initial online and on-street surveys, would be gathered. The artefacts also acted as a common ground for all the participants and this allowed all of the responses to be analysed in accordance with a common theme.

The interviewer needed to explain to the participant the reasons for the artefacts as a tool for elicitation. This approach to gathering information had benefits for all involved in the research;

- by using artefacts the participant saw that the interviewer had carefully prepared which in turn led to an enthusiastic participation
- the participant was able to explore the subject knowing the boundaries of interest of the interviewer, therefore they felt that they were neither hindering the research nor wasting their own time
- the interviewer was able to guide the participant through the interview, whilst also focusing on the areas of interest to be discussed. The artefacts also had the ability to facilitate the interviewer or participant to return to issues missed out or sidelined during the discussion
- the artefacts made the participant and the interviewer feel at ease and created a starting point to begin conversations. Because the interview was limited to approximately one hour, it was essential to achieve a good interviewer and participant relationship as quickly as possible, whilst also being able to collect relevant information
- any issues surrounding the potentially embarrassing subject were able to be brought up by either side, hopefully, in a comfortable manner.
- interviewer and participant were able to use the artefacts to help explore the area and explain any issues that arose

3.5.5.1   The artefacts

A set of twenty-four words (Appendix 5) were provided as prompts. These words were chosen due to the results of the research from the main study. The words were printed onto card and each card was the same size as a playing card, 89mm by 57mm.

The 'word cards' were accompanied by 'image cards' (Appendix 6), of the same size. The 'image cards', are an essential part of this methodology as it was important participants remained focused on the products being investigated. The 'image cards' are also important as they meant that the participants would be discussing the same products all with the same reference point.

3.5.5.2   The materials

This process of creating the artefacts was low cost; this was advantageous because new artefacts were able to be produced when necessary. In addition, the photographs and diagrams, used to create the artefacts, were all owned by the researcher therefore no extra cost was incurred in sourcing these.

Card and ink were the only materials used to create the artefacts. The artefacts were printed onto card rather than paper to facilitate user interaction during the interview. The intention was for the participants to interact with the artefacts; move them about, look at them, write and/or draw on them, or, discard them and not use them. These artefacts were produced so they would not be considered as 'precious'; they were to be seen as a tool. If they appeared to the participant as precious then they would have been less likely to be used as intended.

The artefacts were to be used by the participant and interviewer as a means of communication. Their use was intended to make the interview more interesting and to engage the participant in the research. It was hoped that although dialogue was to take place and be the main source of direction, the artefacts were there as a means of support.

When conducting the interviews it was necessary to introduce the research to the participants in order to clarify the nature of the study. Although participants had received the pre-letter email explaining the research, it was not presumed all participants had read and fully understood the requirements. Therefore, at the beginning of the interview a brief explanation of the process was given. Participants were also reminded they were able to leave the interview and withdraw from the research at any point without need for an explanation.

3.6 Interview structure

A record of who was being interviewed was made along with the location. Although the majority of the interviews were made at the University it was essential for the University to know where the researcher was if off campus, and if on campus, rooms had to be booked.

All of the interviews started with a short explanation of the interview process, as well as, reminding all participants they could withdraw from the interview at any time. Participants were then asked some 'personal' questions and some introductory questions. As all participants were self-selected volunteers and had taken part in pilot and/or main study and/or had contacted the researcher, this was seen as a sufficient 'ice breaker' to the subject. Participants were then presented with a set of questions; this was followed up with a discussion. There was no particular order for these questions. The main issue was that they were all asked; the order of the questions was determined by the interviewer according to the response to the previous question. The data was recorded using a digital voice recorder that was later transcribed verbatim. Where necessary, notes were taken during the interview and were used to clarify any of the interviews at a later date. At the end the participants were thanked for their time and participation.

The interview protocol was based on the six points as presented by Creswell (2007);

- state whom is present, when and where
- plan a procedure to assure there is similar practice between all interviews. the procedure contains four of the points
  - introductory section; introduction of the interviewer to the participant and discussing the process for the interview
- 'ice breaker' questions; gathering background information about the participant, followed by the more poignant questions
    - subsection a) concentrating on discussing the toilet
    - subsection b) concentrating upon discussing either urinals or sanitary waste units: this was dependent upon the gender of the participant
- affirmation of the poignant questions; using the word cards to ensure all areas were covered, if any were left out during the semi-structured interview and to help in revisiting areas of particular interest. Some cards would have already been discussed.

- time to record the data; this was done using notes and digital voice recording as well as some photographs.
- acknowledgement for the time the participant has spent.

It was not presumed that because a participant was of one gender, they did not have experience or views of products associated mainly with the other. If the participant was a carer for another person of the opposite sex and was answering about the experiences of the person for whom they cared for, this was be taken into account as it was relevant to the research.

3.6.1 The toilet

In this section, eight themes were identified and there were nineteen questions focused upon these themes. As with the initial studies these themes were concentrated upon;

- availability
- privacy issues
- product use
- perceptions and expectations
- hygiene
- usability
- emotional effect
- user requirements

These themes were aligned with those used in the previous studies as it was felt that by following a similar layout it would assist the interview process and provide a familiar set up for the participants.

3.6.2 The urinal

This section was similar to the toilet section but was aimed specifically at men and their use of urinals. It contained four themes and eight questions asking participants about;

- product use
- product preference
- privacy issues
- user requirements

3.6.3 The sanitary waste unit

This section was similar to the toilet section but was aimed specifically at women and their use of sanitary waste units. It contained three themes and eight questions asking participants about;

- product use
- emotional effect
- user requirements

3.7 Piloting the methodology

As with all studies, a pilot was conducted. This enabled any issues that arose from the research methodology to be detected and for adjustments to be made before the study was opened to the public.

Men and women were asked to participate in the pilot; this was necessary as both genders took part in the main study. It was possible that the interview questions may not have been correct, or the artefacts which made up of the prompt words and images were confusing. It was necessary to investigate these and any other potential problems; the pilot study was undertaken to achieve these objectives.

The pilot study was performed in two stages. Stage one involved having an almost complete version of the research questions and artefacts, as well as, the other, extra items that needed to be used in the full survey i.e. digital voice recorder and digital camera. This pilot study was used to enable the interviewer to practice interviewing, as well as, learning how best to use the electronic equipment to avoid any problems when running the full survey. The problems arising from the pilot were that there were too many artefacts and they were not big enough. Some participants found certain artefacts of no use and these were later excluded whereas others were identified as being useful so were kept. After the participants in the pilot had identified these cards a final selection was made, presented to the pilot participants and again trialled with a second pilot. The second pilot did not bring up any of these problems; therefore it was seen to be successful and ready to be launched as a study.

3.8 The interviews

The interviews were all conducted in rooms where only the interviewer and the participant were present; this was to allow for privacy, but also for clarity of digital voice recording.

The interview comprised of six stages of protocol, as previously mentioned. The question and discussion sections were interchangeable and quite often overlapped to allow for the natural flow of the conversation. The artefacts, along with the predetermined questions were used to guide the interview and to set the boundaries. This proved successful and all the interviews were between 30 and 70 minutes in length. In total over four hours was spent interviewing female participants and almost six hours for male participants, see table 3.1.

Table 3.1: Interview participants and times

Participant Female	Time hr:min:sec	Participant male	Time hr:min:sec
F24	00:46:17	M26	00:54:33
F29	01:15:34	M41	01:02:10
F31	01:07:37	M47	01:08:03
F38	00:42:54	M56	00:54:53
F42	00:56:08	M60	00:46:15
F79	00:33:56	M80	01:02:46
Total time	**04:02:26**		**05:48:40**

The interview was designed so each participant would answer questions related to each area of interest twice; the intention was to clarify any erroneous answers at the time of the interview by employing this technique. As with previous studies, men and women were asked some questions that were relevant to both genders, as well as, gender-specific questions. Men were presented with a section about urinals and women with a section about sanitary waste units. Both men and women were however, given the opportunity to discuss all the items being researched.

3.9 Coding and Clustering

Qualitative data was collected in this study and due to the nature of the interviews and the volume of data it was decided that 'coding and clustering' would be the most appropriate way to analyse the data.

Coding and clustering allows the researcher to cross-reference different interviews. Weighting was important, especially with this study, as it was necessary to interpret the users' emotions with the products. If there was a large volume of information gathered on any one subject or specific point, it was considered to be of greater importance and therefore was weighted higher, likewise, if there was a lack of information this was also noted as this could potentially indicate a finding. Participants may have been comfortable speaking about certain subject areas, consequently providing an abundance of information, or they may not, thus resulting in a void. It is possible to deduce from the findings that, in general, this had not been the case with this study as it is believed that the participants felt at ease with the interviewer and therefore offered the relevant and correct information.

3.9.1.1   Preparation for coding and clustering

Prior to the data analysis it was necessary to transcribe the twelve interviews verbatim. It had been considered, prior to conducting the interviews that digital voice recordings supported by the notes made in the interview may have sufficed for data analysis to later allow for coding and clustering. However, it was felt by the researcher that this could also allow bias in terms of the interpretation of the data. The notes made during the interview were made in relation to the conversation, and it would not be possible to assure that no bias was made. By transcribing the interviews verbatim it greatly reduced the risk of bias in the analysis of the data.

Once the interviews had been transcribed they were reread by the researcher who already a good understanding of the data as they were also the person who conducted the interviews and transcribed them. This was advantageous because certain themes were already identifiable within the interviews; this aided the initial coding (figure 3.1). Coding was used to identify area of interest in the data prior to translating the meaning of the data (Rossman and Rallis, 1998).
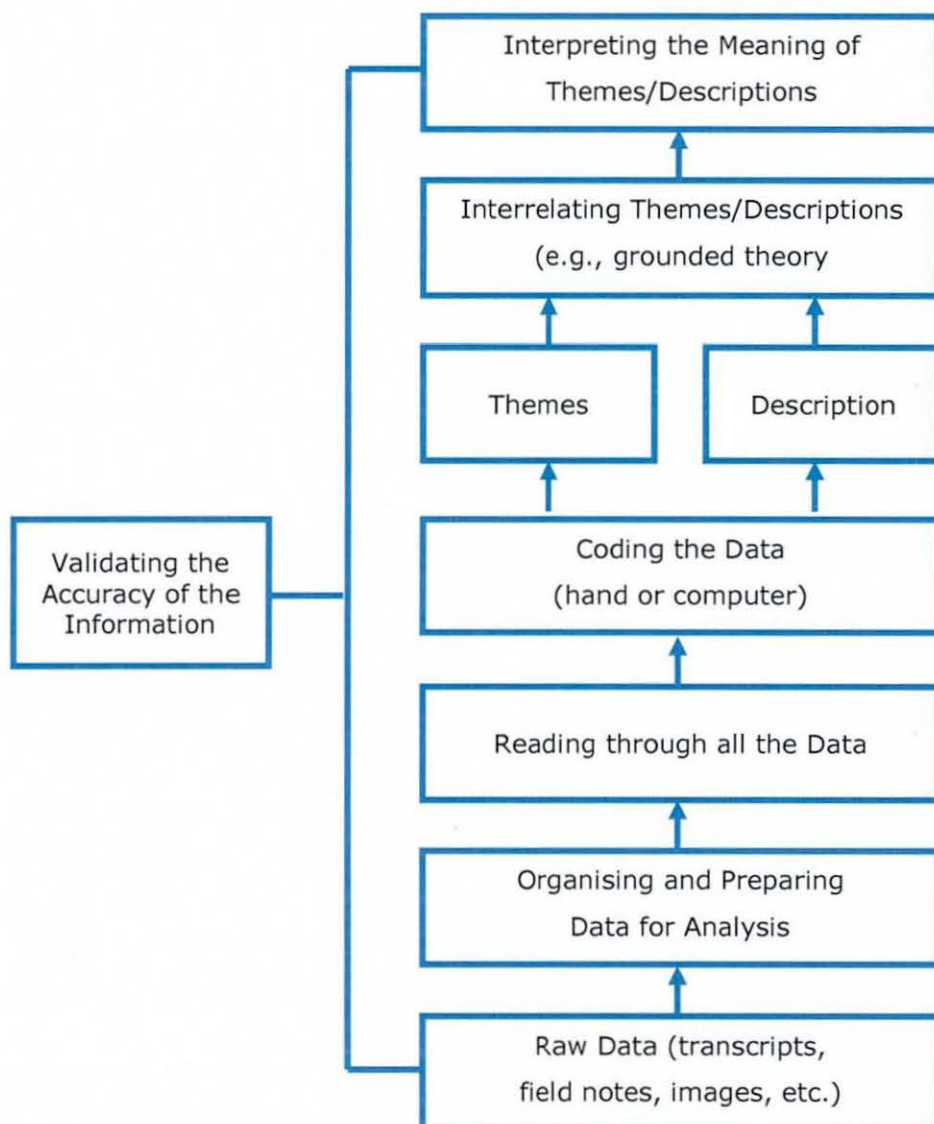
Figure 3.1: Data analysis in qualitative research (Creswell, 2009: p185)

It was initially thought there would be three main topics or higher level coding or the 'route of the code', this was followed with lower level coding. A cluster of information is summarised into a code, this cluster can then be compared/supported by the same or similar codes from the same or other interviews with greater ease than stand alone sentences and or paragraphs. This process is known as 'coding and clustering'.

There were a total of nine initial higher level code categories as shown in table 3.2. Each of these higher level codes was then subdivided into a string of code. The code was dependent upon the subject of the phrase or paragraph. It was also coded according to the importance of the topic i.e. if in toilets (**toi**) a participant spoke about design (**des**) in relation to the flush (**flush**) and then

the action of the flush in this instance pulling the chain (**pull**) but they spoke negatively (**neg**) about it then the code would look like this; ***Toi-des-flush-pull-neg***. The code would form the same genetics dependent upon the topic ***Toi-des-flush-push-pos*** would be referring to the toilet design of the flush, in this instance a push type and the participant would have provided a positive reaction to this design feature. Due to abundance of information, at times as many as up to six levels of coding needed (see Appendix 7). This way of coding provided structure and allowed easy identification of interest areas. From all the interviews a total of the number of phrases or paragraphs starting with the nine major higher level codes can be seen in table 3.2. This clearly highlights the area's most spoken about; cubicles, public conveniences, sanitary waste units, toilets and urinals.

Table 3.2: Higher level code areas and numbers of subsections

Higher level code	Number of subsections in each line of code
APCs	3
Cubicles	28
Portaloos	1
PCs	46
Sanitary waste units	37
Squat Toilets	14
Toilets	125
Urinals	53
Other	1

Using this code allowed for the identification of themes within the interviews to be analysed. Once the initial higher level code was identified and grouped the codes was again sorted so the second level of code became a 'new focus' this continued through the levels and in each cluster. Some of the codes are the same apart from the ending where it was possible to determine whether the response was positive '**pos**' or negative '**neg**'. This meant there were more codes but also facilitated identifying the users' emotional responses to the products accurately and aided writing them up.

3.10 Best practice guidelines for designers

All the previous research performed had been analysed and compiled into a 'best practice guide' for product designers of public convenience sanitaryware

products. This resulted in a pamphlet being created; subsequently this has been tested and evaluated for its effectiveness and appropriateness with designers.

When researching user-product relationships, with the aim of the project to create guidelines to aid designers, it is necessary to understand the way designers work and think. The researchers' background is in design and therefore there was already an established understanding of this. However, it could not be presumed that the guidelines would be appropriate to the task; as such, it was necessary to test them by approaching product designers to use them and design with them. The emphasis of the guidelines was on the end user of the products; the guidelines had to reflect this.

Fortunately, being based at Loughborough University there was little difficulty getting a sample group together. As with all studies, a pilot was conducted. A sample group of fifteen participants was formed. From this group two were selected as experts for the pilot. The reason for their selection is they had been familiar with the concept of the research prior to this study and were based in Loughborough. The other participants comprised of undergraduate Industrial Design and Technology students at Loughborough University, graduates from various industrial/product design backgrounds, practicing product designers and four sanitaryware designers based at Twyford Bathrooms, part of the Sanitech Corporation.

3.10.1 Funding

As with the previous studies no funding was available, however the researcher offered 'pay back' services should they be suitable for any projects concerning the participants in the future. All printing costs for the pamphlets were met by the researcher and participation was voluntary from all candidates. Designers were approached and informed about the research; a short verbal explanation was made to discover interest. Again, the process was made as transparent as possible and it is felt that this helped achieve a high participation rate. As with all research participants were informed of their right to withdraw from the research at any time without need for explanation.

3.10.2 The designers

It was important to have industrial backing for this part of the research. Prior to this study industrial backing had specifically not been sought as it was felt that

it may have added a bias to the research. As the aim was to convey user needs, users have been extensively investigated and industry has not. This way the data is independent. However, now that the research has been conducted industrial representatives from the sanitaryware industry were approached to participate in the research. It was also felt the sample would have been insufficient without their input, however, other participants were needed as four designers, albeit sanitaryware design specialists, would have not provided a large enough sample. Many of the participants had industrial experience or were working in industry.

Once designers had shown interest in the project an initial meeting was set. This was so the researcher could talk them through the design project and answer any immediate questions the participants had. If it was not possible for a person-to-person meeting a telephone call was made to hold the same discussion.

In the brief meeting of about ten minutes, the researcher explained the process of the project, reiterated the participants right to withdraw from the study and asked participants to sign the informed consent form. It was also at this time that a second meeting was arranged, in around a week's time from the start date, to have a short follow up interview.

As with all the previous research a mixed-method was employed. This mixed-method had two main stages;

- the design exercise
- the interview

3.10.3 The design exercise

The interview was held at the end of the design exercise. This comprised of a short questionnaire (Appendix 11). It would have been possible for the data to have been collected by asking the participants filling in the survey themselves; however it was felt that more precise information would be elicited should the interviews take place in person or over the telephone. Also, it was at this point the sketch sheets were handed over to the researcher.

The sketch sheets were looked at to see how the participant had gone about designing the product/products and whether the designers had made reference to the pamphlet. As with the previous interview, the six steps as set out by

Creswell (2007) were adhered to. The interview was conducted in the way of a structured interview, whereby the investigator would fill in the questions in a pre-determined order. The rational for this methodology was that the researcher would be able to personally thank participants, as well as physically collect the data saving the participant time and expense sending the forms back. Also, if participants filled in the forms themselves they might not provide as much information as if the researcher did it.

The interview was split into six sections;

Section one – participant information; this collected personal information about the designer.

Section two – appearance and content; the pamphlet was intended to engage with the designers. As design is a visual language it should communicate visually. The text used and image presented should engage the designers and communicate with them appropriately.

Section three – using the pamphlet; if the designer was interested and had engaged with the pamphlet by visually inspecting it was then necessary to deliver the message of the guidelines and ultimately of the users. It was necessary to ascertain how successful this had been. Keeping the designer engaged with the pamphlet was essential, as the longer they spend looking at and reading it the more information they will hopefully digest and then translate into a design.

The pamphlet was presented in two sections; full pages of text and/or images and 'mix and match' pages where nine different combinations of user elimination tasks and environments were presented. The designers were asked which areas of the pamphlet they used and which they found the most useful. Should this project be repeated for another product it would be interesting to see how best to engage the designers and to deliver the information in a way that best suits them.

Section four – designing; this section was concerned with discovering the influence the pamphlet had on the designers and to what extent they realised its usefulness. Also, here it was asked if the designers had noticed that they had not been asked to design a toilet, urinal and sanitary waste unit and what affect this had on their freedom of design.

Section five – usefulness; this section is concerned with looking at the usefulness of the pamphlet in relation to the design task that had been set. The designers are also asked to express their enjoyment in terms of using the

pamphlet and finally they are asked what their reaction was towards the pamphlet, now that the design task is completed.

Thanks - Participants were asked if it would be possible to contact them again should there be any further questions arising following an in-depth look into the sketch sheets.

3.11 **Conclusion**

Careful planning of all the studies ensured their success. This was achieved through investigation into studies that had previously used the same or similar techniques and applying appropriate methodologies depending upon the date to be collected. These methodologies were then altered to make them appropriate to the task.

All of the methodologies employed throughout this PhD study were chosen for their appropriateness to the task but also their appropriateness for the researcher and participants. It was felt that it was essential to use methodologies that would suit the researchers' strengths. As such, this led to the adaptation of some of the methodologies, such as was the case with the mixed-methods, particularly with the person-to-person interviews using the word and image cards for data elicitation, as well as the development of the pamphlet with its interactive interface as opposed to a list of recommendations.

It is possible to conclude that the methodologies employed have allowed for the appropriate and desired data elicitation and that these methodologies, due to the success of the data collected had been accurately planned and conducted resulting in a successful PhD study.

A flow diagram showing how the individual investigations answered the research aims and objectives, set out in section 1.2, is shown next (Table 3.3). This diagram can be used as a reference through out the thesis to demonstrate the links between the studies and ultimately achieving a contribution to new knowledge.

Table 3:3 Flow Diagram of Study Structures

Literature Review (Chapter 2)

Product Design   User-Product Interaction   In Use Environment

Initial Exploratory Study (Chapter 4)

INFORMED

Types of Conveniences   Types of Products

Pilot   Online and On Street Study (Chapter 5)

User Requirements

Interviews (Chapter 6)

Emotional Needs   INFORMED   Product Specifics
Physical Needs   Environment

Design Resource Development (Chapter 7)

Creation of the Pamphlet

Pilot   Designer Study (Chapter 7)

Designer Interviews (Chapter 7)

Evaluation of   INFORMED   Usability of
Design Resource   Design Resource

Discussion (Chapter 8)

Physical and Emotional User Needs

User Behaviour

User Centred Design

Conclusions (Chapter 9)

CHAPTER 4: EXPLORATORY PILOT STUDY

4.1 Introduction

Following the literature review, it was found that public conveniences were sometimes misused by the public that they were intended to serve. It was decided that to progress the study the reasons for this misuse should be further investigated. In order to achieve this, an initial exploratory study was conducted to test the appropriateness of the proposed data collection technique, online data collection. The initial exploratory study was aimed at investigating how the public might use these facilities and to identify user patterns and emotions towards 'away from home' public conveniences. The study was also supported by informal conversations with participants. Participants involved with the informal conversations often heard about the research and contacted the researcher to discuss matters directly, or to elaborate on a previous communication. These conversations were not originally planned as part of this investigation; however they were essential in validating the findings from the surveys. The results and conclusions from this initial exploratory study also highlighted possible areas for further research; however, the main aim was to confirm the effectiveness of possible research techniques. Future research built on the success of this study and data was later gathered by using email addresses submitted with the answered surveys.

4.1.1 Aim and objectives

The aim of the initial exploratory study was to pilot the research methodology identifying user trends and emotional reaction towards all 'away from home' public conveniences and to obtain information concerned with the user group of men and women aged between 18 and 65 years old (as shown in Section 3.3.2).

The objectives were to;

- investigate the public's perception of public conveniences
- develop an understanding of how people use public conveniences
- investigate the user relationship with sanitaryware
- identify user patterns of sanitaryware use

- collect a list of potential people who may be able to be contacted for future research
- design and test an online survey and evaluate its effectiveness for data collection

4.2 The participants

The participants of the survey were all self-selected volunteers; this approach was adopted for the next two investigations. In this study a total of 49 completed surveys were received; 23 male and 26 female. The ratio of male to female replies were almost 50:50 giving each question a balanced impression of gender differences in attitude and approaches to its use.

Due to the survey being sent out via email it was not possible to establish how many people received the link through the email being forwarded on by the original 43 recipients. An expected approximate return of completed surveys was estimated at 30% (12 participants). However, the actual response rate was more than four times this. The message in the email asked the recipients of the email to forward the message in the email on to people they thought might like to take part this was successful; six additional responses were obtained to the original number of emails sent out. All of the replies used were sent out and received within a seven-week period. This proved that distributing the questionnaire via email was a successful medium by which to engage with participants and was employed again in the later studies. Of the 49 completed surveys, 15 people gave their email addresses this allowed future research to specifically engage with these participants for help.

The age range of the participants was 22 to 61 years of age, this covered most of the intended target audience.

4.2.1 Rejected results

Some of the responses were identified as being incomplete, duplicates or deemed as false, therefore they were rejected, and this resulted in the removal of four of the submitted surveys. Although it was not possible to say that there were no repeated questionnaires submitted, efforts were made to remove any that appeared to be. After removing the rejected results and replies, the final accepted set of results could be analysed.

4.2.2 Participants' disabilities

None of the participants identified themselves as being physically disabled. However, of the 45 completed surveys; three women and two men said they sometimes preferred to use disabled access facilities. Female participants said they preferred to use accessible facilities to avoid queuing and also when visiting an 'away from home' public conveniences with children. One of the men said that he used the accessible facilities when there are no other facilities available. The other male respondent said he sometimes required the use of accessible facilities for '*privacy*' reasons due to '*taking his time*'. This does not necessarily mean he always requires the use of accessible facilities; this could be a personal preference. This was an area that had not been identified through the literature and was of interest, this need for privacy was investigated in future studies.

Due to the nature of the survey, only concentrating on the last three 'away from home' public conveniences, it was not possible to draw many findings that support the research project. As such, the responses will be presented briefly and only if appropriate and in support of this thesis.

4.2.3 Personal preferences

It was important to establish where people used 'away from home' public conveniences. The 'work/place of study' was the most common, as people taking part were of employment age this was a predictable outcome. However, 18% of men and 12% of women indicated that one of the last three visits they had made was in a 'town/shopping centre'. This result was carefully considered; as the project was, at that time, concerned with all 'away from home' public conveniences, it was now necessary to determine which public conveniences would be investigated. It was decided that 'work/place of study' and 'pub/bar' conveniences varied greatly because these tend to be privately owned facilities.

Cumulatively 72% of people said that they would try to avoid visiting an 'away from home' public convenience. This is a large percentage, when it is considered that all but two of the participants indicated they had a profession or were studying. This means that the participants were likely to be away from their homes during their working hours. It was now possible to determine that,

although 'town/shopping centres' was not the place most frequented for 'away from home' toilets it was definitely a 'popular area' and through observation it was decided that LA provided public conveniences tend to be of a similar standard. This was an important conclusion as it was LA free of charge facilities, intended to be used by the residents and tourist of the UK, public convenience sanitaryware products that became the focus of the research.

Other questions in the initial exploratory study were associated with the emotional responses participants had to the facilities. It was found that 6% more men than women use facilities in town/shopping centres. This could indicate fewer men avoid public conveniences than women, evidence for this can be found when participants responded to; "*Would you try and avoid public toilets if at all possible?*". The responses received to this question showed that out of the 21 women asked, 86% would try to avoid 'away from home' public conveniences, as would 22 men asked, 59%. However, this response was not specific to LA public convenience sanitaryware products, nor was it possible to determine why there was avoidance. This did provide evidence that there was a problem associated with 'away from home' toilet facilities.

The remainder of the survey required the participants to answer the questions in relation to the last three public conveniences they had visited. Although some interesting results were determined here, it was also felt that this approach; asking about the last three 'away from home' public conveniences was not appropriate for the data collection. This was because there was no control on this variable, nor would it necessarily be relevant, as the facilities that would be investigated in future studies were to be LA public conveniences.

Women's reasons as to why they avoided using 'away from home' public conveniences were because they found that the toilets were "*often dirty and unhygienic*". Statements such as this did not allow there to be any determination of which aspects of the hygiene they were concerned about, nor was it possible to determine which types of facilities were being described due to the survey being for all 'away from home' public conveniences. This general confusion was evident for the researcher as it was difficult to establish where responses were placed, but also the presentation and phrasing of the questions meant that the participants may also have been confused when answering the questions. This was a very important finding from this initial exploratory study. Because it was being hosted online, it was not possible to provide feedback to participants should there have been queries with any of the questions. Further

investigations were needed to be carried out to clarify the questions and identify specific findings.

The initial pilot did highlight areas of interest;

- availability
- accessibility
- hygiene
- emotional effect

The results for this initial exploratory study were, partly due to the nature of the questioning, but also due to the fact that it was the last three facilities being asked about, vague. However certain prominent trends appeared. More Women than men visited public conveniences in town/shopping centres, however, a greater number of men said that they were more likely to use public conveniences in town/shopping centres than women. It is unclear if this was a true trend as the questions were concerned only with the last three visits to 'away from home' public conveniences. The last three visits could depend upon which day of the week the participant answered the questionnaire.

It also showed that despite participants saying they were able-bodied some chose to use accessible facilities, and 4% of men and 6% of women indicated this. This trend was interesting as it raised questions as to why this would be the case, do accessible facilities offer able-bodied users more than just space?

However, despite able-bodied people using accessible facilities, the majority of people did use facilities intended for use by able-bodied users. There had not been a decision prior to the survey being conducted, of whether accessible facilities were to be included in the research. It was decided that only people who would normally expect to be able to use able-bodied facilities would remain the focus of this research.

The informal conversations suggested that the use of accessible facilities is common amongst many able-bodied users; when there is a queue for the gender-specific facilities, or, when the accessible facility is closer than the gender-specific toilet, thus making it more desirable as there is less distance to travel. During the course of the informal conversations, several people have also expressed that they believe accessible facilities are often cleaner than the standard gender-specific toilets.

It was also important to establish the users. In the UK, people are often provided with gender-specific, male or female able-bodied facilities. These may

be accompanied by gender-specific disabled access and baby change but often these are unisex facilities. It was important to establish from the participants which selection they made. Again, the result was predicted but there was no prior proof that this was indeed the case, figure 4.1 shows the results of which selection participants made. It was predicted that the majority of people would use gender-specific facilities, 95% of men and 91% of women made this choice for their last three visits to 'away from home' public conveniences. This confirmed that away from home facilities are often provided separately for each gender. 9% of the women used a unisex facility, as did 5% of men. It was not clear from this data whether this was due to the participants having visited unisex accessible facilities, or if it is due to unisex only facilities being provided.
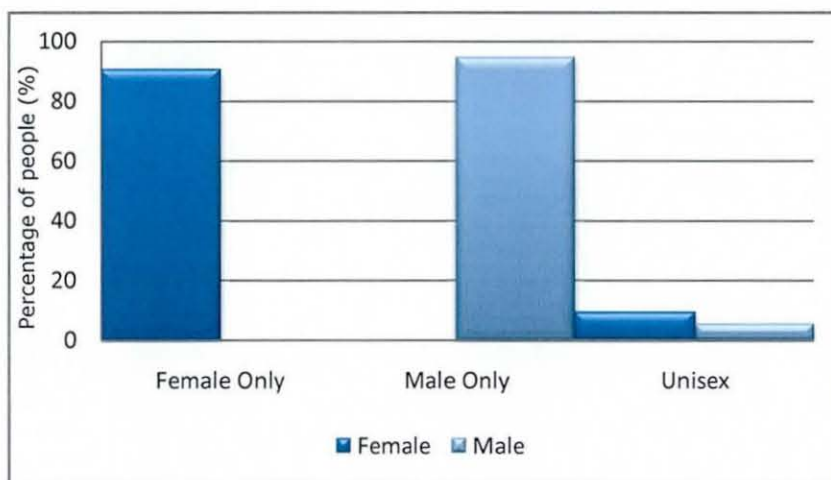
Figure 4.1: What gender selection did you make?

It was also necessary to establish what types of products users were provided with, figure 4.2 shows the results of the different types of facilities available to men and women from the last three 'away from home' public conveniences visits. All of the women used sit-type toilets, whereas the men appeared to have a choice between a sit-type toilet and a urinal.
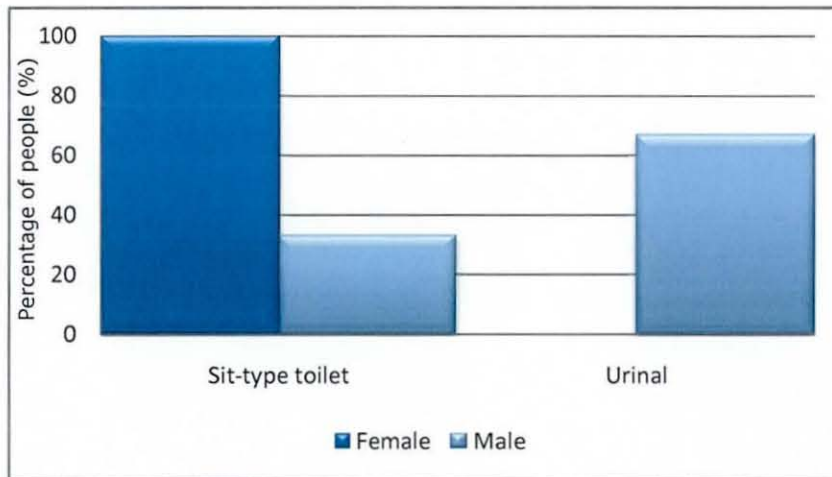
Figure 4.2: Type of facility used by participants

67% of men used a urinal the remaining 33% used a sit-type toilet. This might have been due to having no other options available to use or it could be because the user required a sit-type toilet. Further investigations could look into why there is this apparent trend in the male facility usage.

Figure 4.3, shows that 36% of the female participants, who had been provided with a sanitary waste unit, felt that they did not have enough physical space between themselves and the unit. Touch contact with a sanitary waste unit can be seen as undesirable and due to the contents of sanitary waste units, it could be deemed as unhygienic to place these sanitary waste units in close proximity to the toilet that there might be touch contact between it and the user of the toilet.
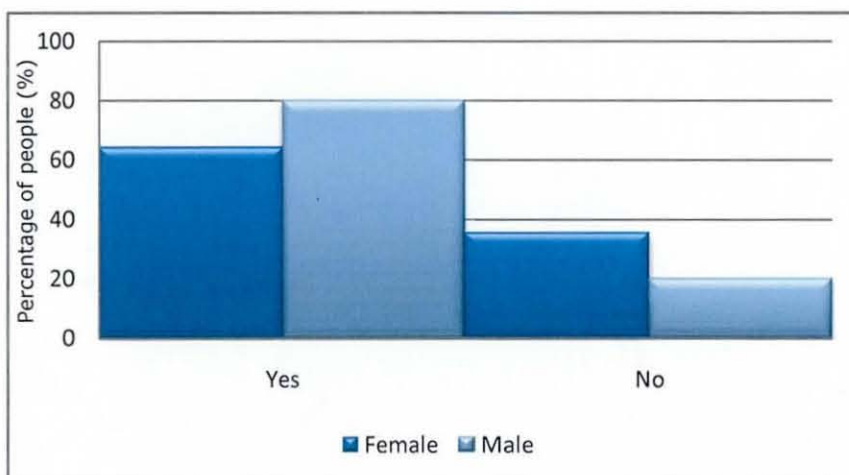
Figure 4.3: Was there enough room between you and the sanitary waste bin to have allowed you to sit down without any touch contact with the bin?

4.2.4 Cleanliness

79% of men and women stated that they felt the facility they used was clean. 21% or men and women felt that the level of hygiene was not up to standard the remaining 78% thought they were.

When facilities are provided it would be expected that they were kept to an acceptable level of hygiene. Almost a quarter of the facilities visited by men and women were deemed unclean by the user's personal standards. These results were translated as communicating how comfortable a person feels about the appearance of the facility.

4.2.5 Use

Figure 4.4 shows that most people use 'away from home' public conveniences for the removal of human waste elimination; urination, defecation and menstruation, were said to be the primary reason for providing the facilities, this result was as predicted. For the women, a very small proportion used the cubicle for other activities such as, using their mobile phone or changing clothes.
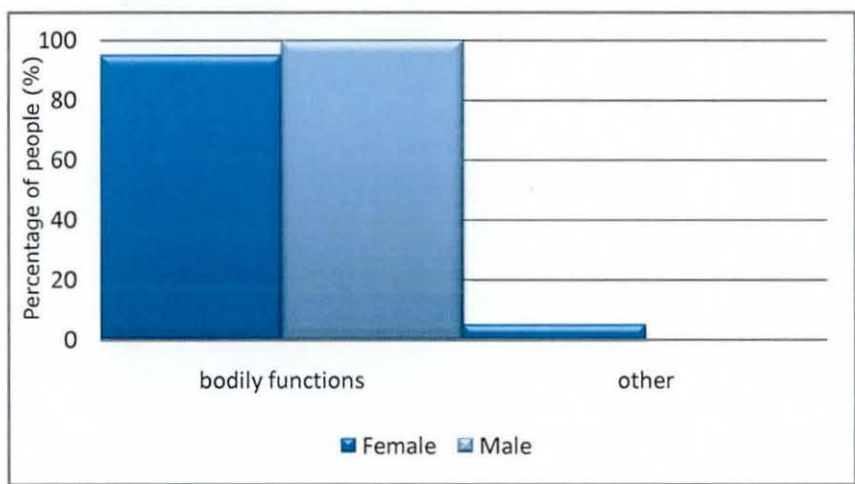
Figure 4.4: What did you use the toilet to do?

From the informal conversations it was possible to establish that many people use public conveniences for a range of activities other than elimination, these other activities mentioned included; changing clothes, telephone conversations, sexual activities, drug taking and dealing.

Figure 4.5 shows how the facility was used. 85% of men used their toilet facilities standing and only 15% used the facility sitting down. 60% of women indicated that they do not sit down when using a sit-type toilet. Instead, they tend to either hover or squat over it.
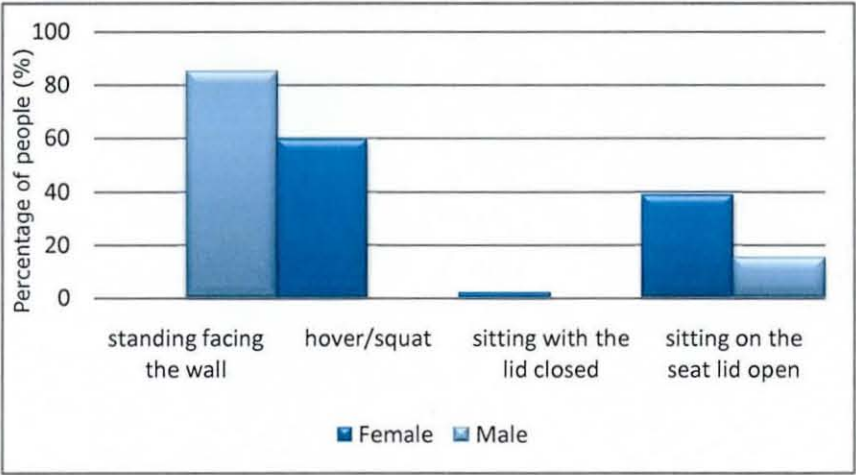
Figure 4.5: What main position did you assume when using the toilet facility?

4.2.5.1 Toilet paper

In this survey 91% of women said that there was toilet paper provided for their use at the toilet they used. From the informal discussions it was felt that the provision of toilet paper largely depended on where public convenience block was (i.e. which town/village) and how frequently the toilet is visited by users, as well as what level it was checked and maintained by staff. Men stated that 14% of the toilets they visited did not provide toilet paper and 40% of the men did not know if toilet paper was or was not provided.

When the participants were asked if they flushed the toilet or urinal 96% of women said that they flushed the toilet, 4% said that they did not. The reasons for not flushing the toilet were generally attributed to mechanical failure or blockages. 48% of men did not flush the facility they used, the reasons they gave were that the toilet/urinal was operated by an automatic flush system or, that there was no flush provided.

4.3 Conclusion

The survey results highlighted some interesting patterns and user relationships in 'away from home' public conveniences usage. The results demonstrated that men and women have use patterns that showed both similarities and differences. Men and women also appear to use public conveniences in similar places for the same generic purpose; elimination of body waste.

The public conveniences that were mainly used were at the participants place of 'work/study', or in a pub. Men and women also generally appeared to use gender-specific facilities although it is not clear from the survey if more than one choice was available to the participant. The user's responses to public conveniences were also very similar as many of the same concerns, such as, the level of hygiene and numbers of facilities were raised with each group.

The evidence from this research would suggest that women put more thought in how they use, including how they prepare to use, a facility, in comparison to men. One in four women will bring their own toilet paper with them to an 'away from home' public convenience. Women will also consider whether to sit, or squat over the facility, men appear to either stand in front of the facility or sit directly on the toilet. Men and women from each group also agreed that there was not enough space provided between themselves and the sanitary waste unit where one was provided.

The pilot proved that the research method was a success as it reached a large and varied user audience within the specified user group who were able to access the online survey. However, it does exclude all people who have no access to the internet. The survey was successful in providing anonymity for the participants. This was in order to encourage participation and honest results. There is always potential with this type of data collection that some people may be dishonest with the information they give.

The method was appropriate for gathering general information; however, interviews with participants on a person-to-person basis would provide a greater insight into the user's needs, however this was unable to be done until an appropriate study had been conducted on which an interview could be based. Surveys allow for a planned and structured approach to collecting data, if hosted on the internet it lends itself to being easily analysed. In addition to this, it provides anonymity to participants, instant access and reply; it is but also inexpensive and non-obtrusive to the participant. With other data collection

techniques such as person-to-person interviews, these can take a long time, have higher overheads and running costs, amongst others. Also with person-to-person interviewing complete anonymity of the participant is not achievable.

4.4 Future work

A list of 14 email addresses was collected from the initial pilot survey; these emails were used to create the starting point for collecting data in the pilot study.

Some of the results of this survey were not as expected and required further in-depth research, it was now possible to focus on particular areas of the design of public conveniences. Future research was designed to specifically concentrate on LA provided public conveniences.

The initial exploratory study also highlighted the need for future work to focus on specifically selected products within the sanitaryware range; the toilet, the urinal and the sanitary waste unit.

4.5 Benefits of the investigation

Conducting the survey provided a database of information that was able to guide the creation and execution of a future studies. It highlighted areas of interest and gave direction for future investigation to be identified as discussed.

Although the majority of the information gathered from conducting this investigation was not carried through into further work, conducting the survey proved an invaluable exercise in developing transferable research skills for future investigations such as; using the internet in order to host questionnaires and talking to users about the potentially sensitive subject of toileting.

This investigation also highlighted how to formulate questions for analysis. Through this procedure, future studies were planned with greater accuracy and delivered detail that was more exact.

CHAPTER 5: INVESTIGATION INTO PRODUCT USE

5.1 Introduction

The research described in this chapter was compiled from a main study that highlighted some of the concerns users appeared to have with public convenience sanitaryware products in the UK. Prior to the study being conducted a pilot was performed. Although this was successful, the sample of participants was not evenly distributed across the age range, as most were from the 20 – 29 year age group therefore this would not have been representative of the UK population. As such, the main study addressed this by incorporating an on-street questionnaire (as outlined in Section 3.1.4).

5.1.1 Aim and objectives

The aim of this investigation was to define the relationships and the needs that the UK public have with specific public use sanitaryware products; toilets, urinals and sanitary waste units. The target user group was the UK public.

The objectives were to identify the publics' expectations of specific public convenience sanitaryware products and to ascertain what the public would like to expect from them both surveys were presented in three sections to obtain this information (see Section 3.4.2). Male and female participants were asked about toilets (as demonstrated in Section 3.4.4.1), only male participants were asked about urinals (as shown in Section 3.4.4.2) and only female participants were asked about sanitary waste units (as shown in Section 3.4.4.3). However male and female participants were given the opportunity to speak about all the products. Male and female participants were asked in the last section to provide personal information (see Section 3.4.4.4). It was necessary to investigate what services the public require from the specific sanitaryware products and to identify the relationships people have with them.

5.2 The Participants

There were 292 surveys used for data analysis for this study. The breakdown of how the participants took part in the survey can be seen in table 5.1. An advantage of this study was that there was almost a 1:1 ratio split of male and

female participants whereas the pilot had had an approximate 3:5 ratio split of male to female participants.

Table 5.0:1: Sourcing the participants for pilot study the and main study
(Number of participants in each study includes deleted participants)

	Male		Female	
	pilot study	main study	pilot study	main study
Online survey; number of participants	59	76	98	101
On-street survey; number of participants	N/A	66	N/A	49
Total number of participants	59	142	98	150
Subtotal Male / Female	201		248	
Total number of participants	449			

The number of participants increased by 48% from the pilot to the main study. This was encouraging as the research was aimed at the whole of the UK public. The greater the number of participants, the more accurate the results would be, therefore the more inclusive the research.

In total 16 surveys were removed from the results, six male and ten female, for several reasons. These were if they were known to have participated in the pilot study, were outside the 18 to 65 age group, if they stated they were not in the UK at the time of answering the survey, or, if the respondent indicated that they were of the opposite gender for which the survey they responded to was intended. In addition, two of the on-street participant's results were rejected due to their surveys being incomplete.

5.2.1 Participants' disabilities

In the study 7% of participant indicated they had a disability. These disabilities included;

Male participants;

- o motor neuron disabilities; Parkinson's disease.
- o communication disabilities such as; deafness.
- o mobility disabilities; obesity, arthritis, Multiple Sclerosis, use of walking sticks, manual wheelchair use and Ankolosying Spondilitis (difficulty in bending).
- o social-phobia disabilities; Avoidant Paruresis

o lifestyles which can cause disabilities such as; manual labour

o other disabilities; diabetes, angina and irritable bowel syndrome

Female participants;

o motor neuron disabilities; Multiple Sclerosis

o communication disabilities; visual impairment and dyslexia

o mobility disabilities; Spina Bifida, Fibromyalgia, general spinal problems, permanent use of crutches, Arthritis, bone deterioration, locking of joints, use of walking sticks, knee replacement and wheelchair use.

o other disabilities; Ulcerative Colitis, above average height (6ft), tendonitis, trapped Ulnar Nerve and pregnancy (eight months)

5.2.2 Participants' ages

The ages of the participants from the pilot and the main study are shown below in figure 5.1. The distribution of ages in the main study is more even than in the plot, where over 50% of participants were aged 20 to 29 years old. This unevenness of the ages in the pilot study was one of the main reasons for changing the approach to gathering the data for the main study. The change was made by incorporating an on-street survey as well. As the age range is more even in the main study and shows that the distribution methods employed during it were successful.
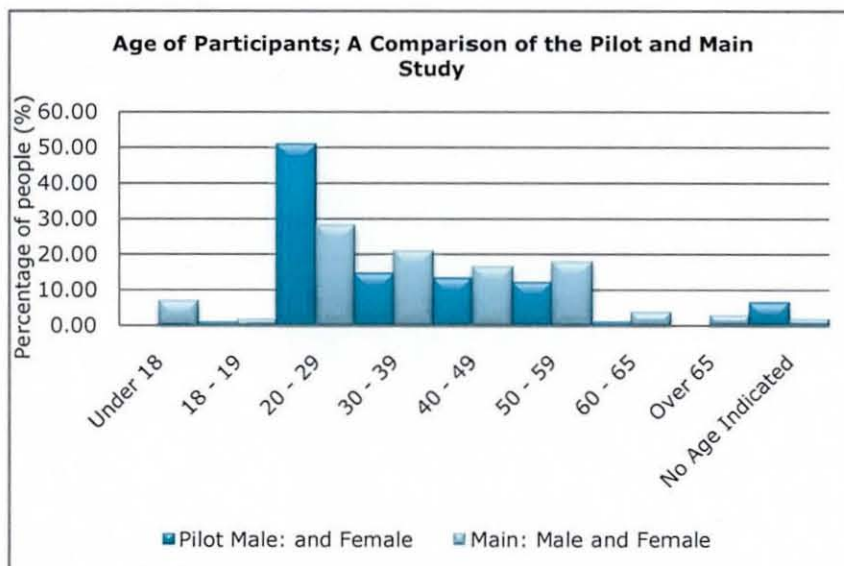
Figure 5.1: Age of participants

There was no specific target age group for the main study; it was open to the public, however, it was hoped that a more even age range distribution would be achieved. Consequently, it is not possible to tell how old the youngest and eldest participants of the survey were.

5.2.3 Religious Allegiances of Participants

The religious allegiances of the people who took part are shown below in figure 5.2Figure 5.2.
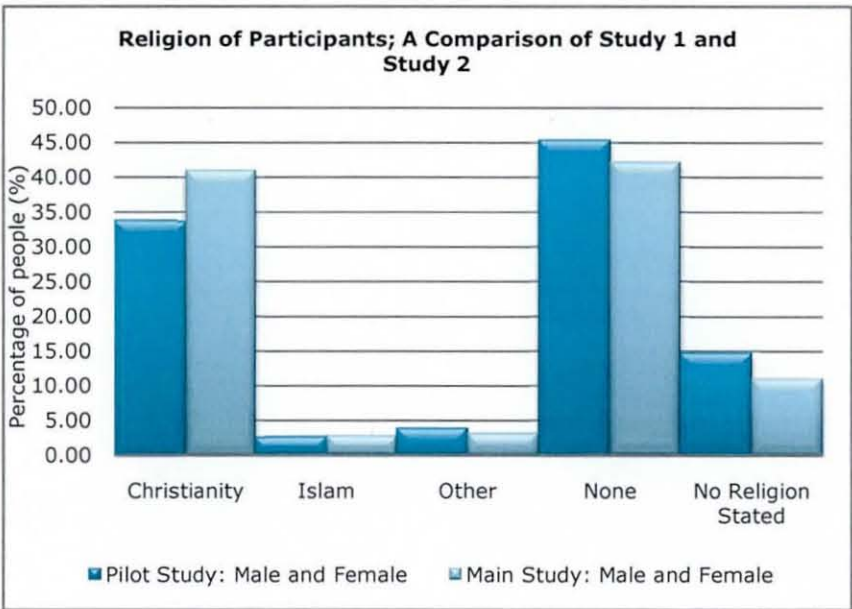
Figure 5.2: Religious allegiance of participants

42% of the participants had no religious allegiance, 34% were Christian, 3% followed Islam, 4% followed other religions the remaining 15% did not state their religious allegiance.

5.3 Discussion

In the discussion section, the term '**agree**' is a combination of the '**agree**' and '**strongly agree**' responses and the term '**disagree**' is a combination of the '**disagree**' and '**strongly disagree**' responses taken from the Likert scale.

5.3.1 Toilets

The user needs and expectations of toilets in public conveniences were investigated in this first section of the surveys. The seven themes in this section will now be discussed (as presented in Section 3.4.4.1).

Availability - Availability of toilets in public conveniences appeared to concern men and women. Female participants appeared to be more concerned about this, as approximately 30% more women than men indicated they expect to wait to use a facility in a public convenience. Only 32% of women, in comparison to 72% of men indicated that they usually found an available toilet for them to use in a public convenience. Despite this difference, women as well as men commented about a need for better provisions of toilets in cubicles providing an increased provision of facilities would be a good start in answering this issue.

However, when participants were asked to respond to the statement; 'generally, in a public convenience is there a free toilet for me to use', 75% of men and 66% of women agreed that there was. This indicates a difference between the perceived and actual levels of provisions of toilets in public conveniences. This was one of the areas investigated further in future research. If facilities are provided and are 'free to be used', as in not occupied by another person, but participants feel they are unusable, then this issue which needs to be addressed. If toilets are unavailable, through non-occupancy this causes a reduction in the number of facilities viewed as available to the participants.

Privacy issues - Initial findings from the pilot study indicated that privacy was a key concern of people when using toilets in public conveniences. In the UK it is common for toilets in public conveniences to be compartmentalised, with cubicle dividers that have gaps at the top and bottom, and not necessarily full-length walls and doors (figure 5.3).

Figure 5.3: Cubicle dividers and doors with gaps at the top and bottom

Suggestions for improving privacy from participants were to use floor-to-ceiling doors and cubicle dividers as opposed to having gaps at the top and bottom (figure 5.4). One female participant has experience of children peering in under the dividing walls whilst she was in the cubicle. However, another participant said, ceiling-to-floor doors and dividers made her feel claustrophobic and that having gaps helps her overcome this.

Figure 5.4: Fully enclosed individual cubicles

The design of cubicle dividers can be attributed to one of the reasons many people, 23% of the male and 30% of the female participants find they do not have adequate privacy when using a toilet in a public convenience. This lack of privacy can lead to able-bodied people opting to use the disabled facilities, as they are generally in fully enclosed cubicles therefore afford greater privacy to

the users, this finding was supported by statements received from the participants.

Cubicles are intended to provide privacy; the levels achieved can however be limited to a basic visual privacy. As previously mentioned, cubicles are very often found with gaps at the top and bottom of the doors; this is sometimes accompanied by cubicle dividers that are similar. Because of this it is difficult to achieve much, if any, audible privacy and this was specifically mentioned as a problem by some participants. One female participant commented on being able to "*hear everyone else going to the toilet and their conversations*" and this leaving her with negative feelings when she used toilets in public conveniences. Providing adequate privacy could possibly make the experience of using a toilet in a public convenience more user-friendly and inviting.

Despite the privacy concerns discussed, 62% of men and 57% of women said it did not cause them a problem if other people were around whilst they used a toilet. It is possible that either people require greater privacy, therefore making privacy a very important issue to them, or some people may not be very concerned about privacy issues, thus making it less important. Privacy could be seen as a black and white area. This was investigated further in later research by interviewing participants.

Product Use - It is important to understand product use or misuse, as it is essential in developing theories on how to improve current designs. Splash back; liquid, water or other, splashing back out from the toilet bowl, is a major concern for users of toilets. 66% of men were concerned about splash back from toilets whereas only 18% were not. It also appeared that for the male participants, the older the participants the more likely they were to be concerned about it. Women also appear troubled about splash back with 66% agreed that it concerned them. This concern was supported by 63% of men saying that they had experienced problems from splash back making the concern a real and not an anticipated fear; whereas only 47% of women stated that they had experienced it. This indicates that the majority of women (65%) were concerned about splash back but less than half of them actually experienced it. This suggests design does affect the emotional response of the act of using the toilet and this act is different for both men and women.

Participants did not tend to comment on how the design of toilets, as a whole, causes splash back but were more concerned about the unpleasant effects of it

such as puddles and wet floors. One male participant said *"toilets are often in a disgusting state through males who pee everywhere including [on] the seat"*.

Toilet seats were a main focus for complaints from both men and women. Both groups added comments directly related to the design of the toilet seat and how it affected the use of the toilet. A male participant suggested that having the toilet seat designed with a break in the front to act as a trap for 'drips', figure 5.5. He continued to comment that the design would possibly mean drips would land in or on the toilet bowl (where the gap in the toilet seat was) and not on the toilet seat. Women also expressed concerns over the state in which they often found toilet seats. Some women indicated this problem had led to a behaviour pattern of always wiping the toilet seat before sitting down.
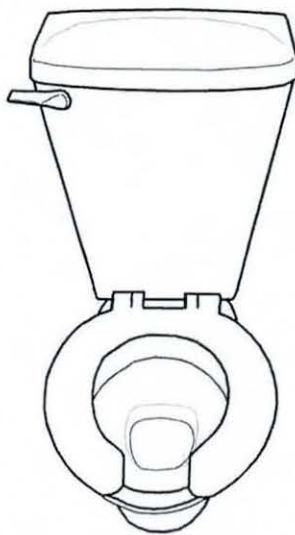
Figure 5.5: Toilet seat with break in the front

It was also observed, by one female participant that in unisex public conveniences, men do not always appear to lift the toilet seat up when urinating. Because of this action, or lack of it, urine may then land on the toilet seat. This was seen as off-putting to her as a user, she described that when she wants to use the toilet she would have to hover over the soiled toilet seat, and this is something that she does not wish to do. The problems associated with splash back are common to male and female specific, as well as unisex facilities.

Perceptions and expectations - The majority of participants, 61% of men and 70% of women, agreed that they generally had a negative perception towards public toilets. Reasons attributed to this feeling of negativity from men focused on the cleanliness and hygiene issues concerning toilets and how these made them 'off putting'. Toilets were described by one male participant as

"*generally unpleasant, smelly and badly lit*", one female participant even described them as "*depressing places*". If this is how people perceive public conveniences it does not encourage the makings of a comfortable and inviting environment.

Participants were also asked if they had positive feelings towards toilets in public conveniences, only 16% of men and 12% of women agreed they did. Results from the male participants showed that, participants aged 40 years old and over, tended to agree with the statement, more so than participants who indicated they were under 40 years old.

Participants indicated through their comments that they would prefer to see improved security in public conveniences. Specifically, female participants felt a need for attendants in public conveniences, as their presence would provide them with a greater feeling of security. As discussed by Chisnell (2006) LAs, in the past, often employed toilet attendants however this is now not the case and many public conveniences are managed by teams of external contract cleaners who service several sites. Employing Attendants in public conveniences, as with most other jobs, requires funding. Findings from a survey conducted in 2004 in the UK suggest 50% of people would pay for better facilities (Hanson, Greed and Bichard, 2004) perhaps this revenue could be used to pay for the attendant. There was also a demand for better locks, specifically locks designed so that the users can see the mechanism. Clear lighting was also seen as important, it was described as creating a sense of being 'inhabited' this is important to consider as empty and/or dark public conveniences may deter people from using them. Although it may be argued that security and lighting are environmental issues that mainly concern management and construction, it is clear that they affect the user's emotional state of wellbeing.

Hygiene - Personal hygiene appears to be of concern for many participants. The main worry for women was cleaning and/or wiping after urination and defecation. Many comments made by participants indicated a need for improved toilet paper provision. One Islamic female participant said she required "*access to water*" in order to cleanse personally after using a toilet to perform the *Wudu* which is a partial ablution (IOLTeam, 2003).

From the responses to the survey, 47% of men and 16% of women felt public toilets were generally not at an acceptable level of hygiene. Within this result a trend was shown that indicated that the older male participants the more acceptable the state of hygiene appeared to be. Of the female participants, only

9% felt that public toilets were generally at an acceptable level of hygiene. Similarly to the male results it appeared the older the participant the more likely they were to agree with the statement. The remaining 74% of women answered 'neutral' to this statement. It is unclear exactly why the majority of women answered 'neutral'. Perhaps this is because, even though the toilet is not 'clean', it is still viewed as usable. Women, unlike men, do not have a choice of different designs of facility to use, and will still use a toilet because they have to. One woman did however say that, "*female urinals should be introduced in order to give women more options*".

Participants were asked if they would normally crouch over a toilet seat because of concerns over hygiene levels. A difference in male and female responses was evident here, only 14% of men, as opposed to, 57% of women agreed they would. In a study conducted in Taiwan, Cai and You (1998) also found that 50% of their participants did not sit on sit-type toilets. This would suggest this is a global concern and possibly not one restricted to the UK. However, it is important to know this trend as the UK plays host to many visitors for holidays and major events, like the upcoming Olympics is 2012 where public conveniences will be playing a vital role in the enjoyment of the event. The female participant's results showed that Islamic participants disagreed with the statement. This could be attributed to cultural and religious practices, in order to establish this as a true trend, further investigation must be carried out. It is argued by some that "*one of the dominant universal influences of social behaviour is religion*" (Warner, 1998: p2). Therefore it is essential not to overlook this when designing products for use by everyone.

It is possible to determine from the information gathered that men and women associate clean facilities with the presence of an attendant, one male participant commented "*attendant supervised toilets are often much better for hygiene and maintenance*". The presence of attendants encourages people to feel that the public conveniences are cleaner, but also the presence of an attendant creates feeling of greater comfort and safety. One suggestion for ensuring attendants were present was to charge people for the use of public conveniences.

Due to hygiene concerns, participants suggested providing information that would indicate the levels of hygiene of the facilities inside the public conveniences. This was to inform people deciding to use them. There are schemes in place that offer guidance about facilities, many have charts; electronic or paper, which show when the last time when the facilities were

cleaned, some even count down to the next time they should be cleaned, figure 5.6

Figure 5.6: Electronic hygiene monitor

The 'Loo of the Year Awards' has been running for over 20 years in the UK. The award aims to evaluate different aspects of public convenience design; interior design, hygiene, accessibility, amongst others. However, entries are voluntary and companies and/or individuals have to pay to enter, therefore it is rare that a public convenience would be entered which was known to be low scoring, unless the providers of the public convenience wished to raise points by doing this. Jack Sim wrote of a successful grading system in Singapore called "The Happy Toilet Program" which was used in preparation for the 2008 Olympics in Beijing (Sim, 2004). There is a 5* grading system for hygiene 1=Worst through to 5=Excellent and Exclusive. This system is being implemented to help improve foreign visitor's negative image of the public conveniences in Beijing. It has so far proved successful. The BTA scheme is similar and grading can be seen in public conveniences that have entered across the UK (figure 5.7) however, this grading is not specific to hygiene levels. The scheme implemented by Jack Sim also informs the locals, as well as the visitors about the state of hygiene in which they will find the public convenience they are about to use.

Figure 5.7: Sheep Street, Northampton, displaying LOYA certificates

Usability - It is essential, especially when designing a product for public use to deal with human waste, that the design should lend itself to being used by multiple users all of whom are different. The products should also be designed around the needs of the users. It is therefore unfortunate then that the current design of the toilet means 45% of men agree that when they start and stop urinating into a toilet from a standing position, urine often lands on the rim of the toilet seat or on the floor. 60% of the female participants also stated that they found it difficult to aim when urinating into a toilet from a crouching position. Only 17% of men and 24% of women agreed that they found crouching over a toilet seat easy to perform. This response also showed a difference between men and women which were that women appeared more concerned about aiming accurately into a toilet when crouching to use it than men. Crouching appears to be more of a problem for women.

Several men mentioned the need for facilities to either be different heights, because they were tall, or because of children not being tall enough. The main complaint from women was the lack of space in the cubicle in which to manoeuvre due to the placing of the sanitary waste unit, this is often found at the side of the toilet, leaving very little room for people to sit down. Several suggestions were made to introduce toilet seat covers, self-cleaning toilets, but above all, more space in order to facilitate toilet usage from a users' stance.

Flushing was also mentioned by participants in relation to usability. One male participant mentioned the need for easy flushing and quicker refilling times. Some female participants stated automatic flushes were a good idea, because

there is no touch contact with the flush handle therefore making it more hygienic.

Emotional effect - Going to the toilet should not have to be an unpleasant experience. It is something all people have to do and should not be something to fear. There are people who suffer from phobias directly related to the use of toilets such as AP. However, the results suggest that although all the participants, apart from one, are not suffering from phobias such as AP there is a majority who still find using toilets an unpleasant experience. 62% of men and 70% of women agreed that they found using toilets in public conveniences to be an unpleasant experience. Issues concerned with; poor maintenance, blockages, lack of cleaning, inadequate lighting and off-putting smells were all attributed to creating this negative experience. On a more positive note, one male participant said that he felt the current design was, in general, *"ok"*.

Male and female participants were also asked if using toilets in public conveniences caused them emotional distress; 10% of men and 15% of women agreed that it did. One male participant, who stated he suffered from AP, strongly agreed that using public conveniences caused him emotional distress. This is not beneficial to the user and goes against the reason for having a public toilet, which is to serve all the public.

Reasons people may be concerned about using public conveniences could be limited accessibility and poor maintenance. Men also mentioned vandalism, in the way of graffiti and damaged products, as a problem. For women, rather than vandalism being the problem, it was the resulting design changes due to vandalism that concerned them. One woman observed, *"if [public conveniences] are open 24 hours a day they generally have metal pans"*. Metal panned toilets (figure 5.8) were described as not being as *"comfortable or appealing"* as ceramic toilets (figure 5.9).

Figure 5.8: Steel panned toilet

Figure 5.9: Ceramic panned toilet

Other, less tangible reasons people may be deterred from using public conveniences could be over concerns about being vulnerable and exposed to unwanted attention from other people. Women also described difficulties they had using toilets while carrying shopping, or, when accompanied by children, however these difficulties were not fully understood and were investigated in future research.

User requirements - It can be seen from figure 5.10 that for both men and women alike, the most important requirement concerned with toilets in public conveniences is hygiene. This is followed by no splash back, which has hygiene and usability issues. As previously discussed splash back is a major cause for concern amongst the users. The manner in which the user then interacts with the product is the next set of important concerns, including the need for better ease of use and more space. Styling appears to be of little concern to users, as does extra support.
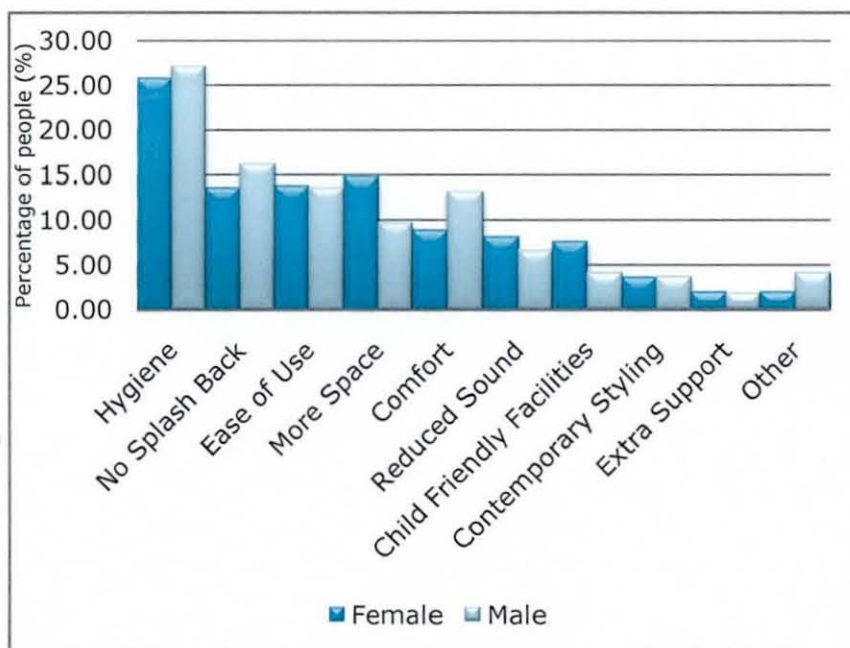
Figure 5.10: Male and female requirements from a toilet in a public convenience

5.3.2 Urinals

In the UK, there are two main styles of urinal, the individual porcelain urinal (figure 5.11) and the stainless steel trough (figure 5.12) urinal. Male user needs and expectations of urinals in public conveniences were investigated in the second section of the male survey. The three themes in this section will now be discussed (as presented in Section 3.4.4.2).

Figure 5.11: Ceramic individual urinals

Figure 5.12: Stainless steel trough urinal

Product use - 95% of men agreed that they found urinals easy to use and only 2% disagreed. However, despite this apparent ease, 33% of men agreed it was hard not to get splash back from urinals. Urine that misses the urinal, or, splashes back, can lead to puddles forming on the floor. It was these effects of splash back that concerned the participants the most. One participant commented on an observation he had made; urinals are often set at different heights depending upon the public convenience, this can contribute to making them difficult use thus creating splash back. Men were also asked a supporting statement for the 'product use' section. *"When I start and stop urinating, urine lands on the rim of the urinal or on the floor"*, 34% of male participants agreed with the statement, and 44% disagreed. These results support the findings that men find it hard not to get splash back. Part of this problem could be also due to the effects of splash back; lack of floor drainage. Adding floor drainage could help reduce the effects of this problem, but so could urinals designed to reduce, or, eliminate the effects of splash back causing urine to land on the floor. Further investigation was needed to ascertain more specific issues with splash back, its causes and the effects it has on the users.

Space, more specifically the lack of space, between individual urinals was mentioned as a problem by some users. This was not necessarily due to a lack of privacy but because of the width at which the urinals, and particularly the partitions are set as not being wide enough, some men expressed how they felt they would not fit in comfortably.

The flushing of urinals also appeared to cause men a problem. Many urinals work on a urinal siphon. A urinal siphon is an automatic mechanical flush; this is only interrupted if the water to the cistern is turned off otherwise it is on a

continuous cycle. Because of how a urinal siphon works, it is not necessarily apparent to the user when a flush will occur; because of this, flushing was described as "a hazard". Many men wanted to see more automated flushes which work with an IR so that the urinal would only flush after each use and not during use.

Product preference - There are two main styles of urinals: individual and trough; and both have associated problems. It appears men want to have individual urinals but recognise that trough urinals are practical. One advantage of individual urinals is that it is possible to have them set at different heights so that some are able to be available for boys or shorter men (figure 5.13).

Figure 5.13: Urinals set at different heights

Men usually have a choice in public conveniences whether to use a toilet, or a urinal. 71% of men said that they would always use a urinal rather than a toilet if possible. However, almost 17% of men opted to use a toilet in preference to a urinal it was not clear as to the reasons for these results so consequently they were investigated further in future research.

When the male participants responded to the statement; "I prefer to use toilets to urinals for urination", 25% of men agreed and 57% disagreed. It is unclear why this is; urinals have been used in public conveniences for many decades and most people in the UK are familiar with them. A reason for the majority of men choosing to use urinal rather than toilets could be that men may have observed that urinals tend to be cleaner than toilets. However, 25% of men still choose to use toilets rather than urinals for urination, reasons for this could be attributed to urinals causing splash back that can soil trousers, men may not wish to have soiled clothing so choose to use a toilet instead to overcome this problem. Another reason could be, perhaps some men feel vulnerable when

using urinals, or, because urinating takes them longer so they prefer to use toilets. Another reason could be that urinals may not offer enough privacy, again, it is unclear as to the reasons and these will be investigated further.

Privacy issues - Similarly, to the findings from the 'Toilet' section of the survey, privacy is a major concern for users of urinals. 25% of the male participants indicated that they minded having other people in the proximity when they used a urinal; this included a man suffering from AP, who stated that he strongly disliked other people being present when he uses a urinal. Interestingly AP affects more men than women (Pillinger, 2005). AP can affect anyone, but this tendency for it to affect more men than women may be attributed to there being less visual privacy available to men. This could account for 31% of the male participants agreeing that that they dislike other people to be present when they use urinals. Participants also said that it was not just a case of people being conscious about their own privacy, but they also do not wish to see other men urinating. Some participants stated that they liked the design of the urinal but felt that there was *"insufficient sideways privacy"* and would like to have some urinals placed in cubicles, to create choice for people who preferred to have greater privacy. Sideways privacy can also be provided by placing shoulder to knee dividing screens between urinals (figure 5.14).

Figure 5.14: Full-length dividing screens at urinals

One participant stated he preferred to use trough style urinals, as opposed to the more popular individual urinals, as they allow him to choose how much

space to leave between himself and the next person rather than being at a predetermined distance from other users.

User requirements - It is possible to determine from the graph in figure 5.15 that, as for toilets; men who use urinals have placed hygiene as their top priority. Again, this is seconded by no splash back. Child friendly facilities and contemporary styling appear to be of less concern.
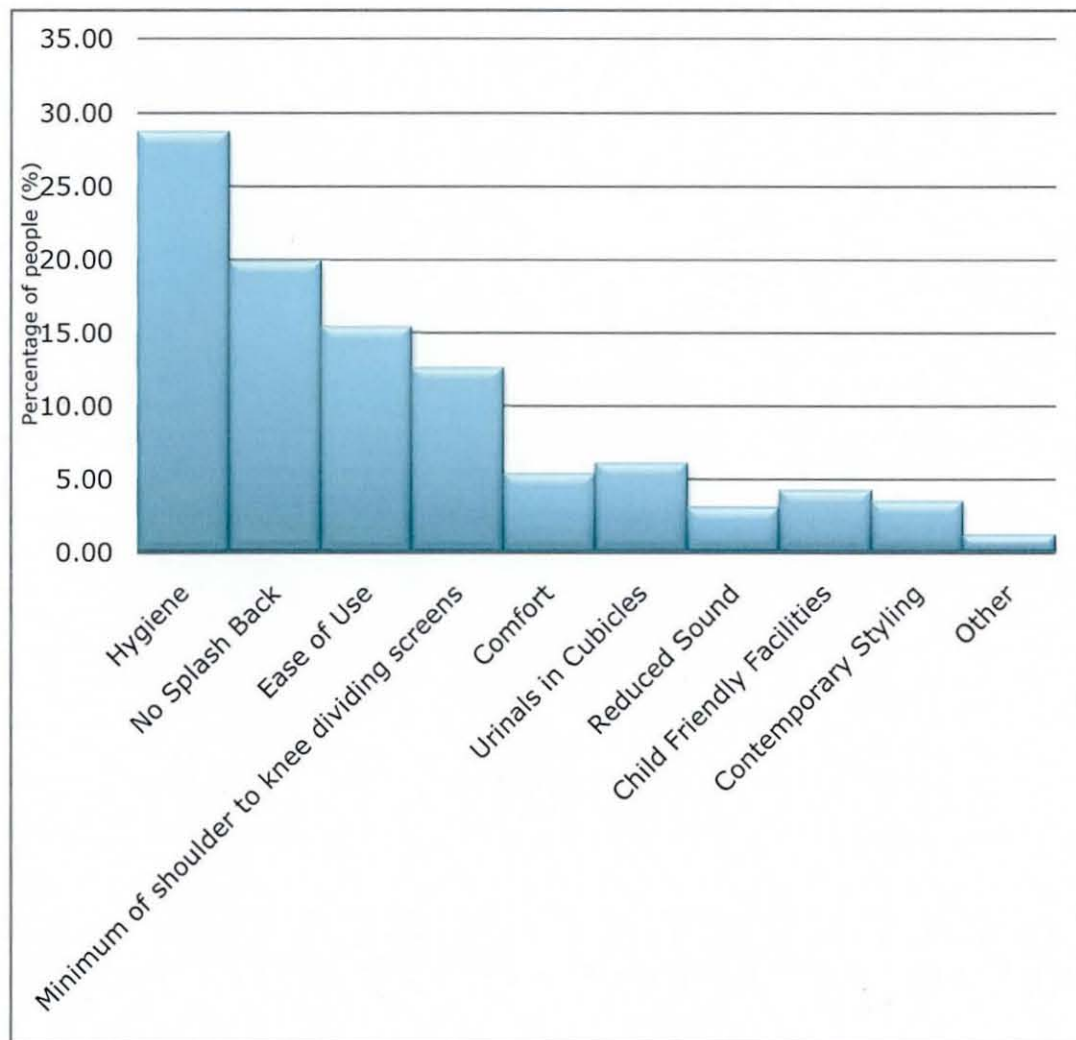
Figure 5.15: User requirements from urinals

5.3.3 Sanitary waste units

Sanitary waste units are provided for the disposal of sanitary waste (tampons and sanitary towels). For the purposes of this survey, it was assumed that all of the women who answered this section had reached puberty, therefore, creating

a need for sanitary waste disposal facilities. However, some of the women surveyed will have gone through the menopause, they may have medical conditions, or, be on medication that prevents them from menstruating, therefore having no need for sanitary waste units. The two themes in this section will now be discussed (as presented in Section 3.4.4.3).

Product use - Sanitary waste units are meant as a convenient and hygienic solution to the disposal of menstrual waste. 58% of women said that sanitary waste units in public conveniences were very convenient, while 21% disagreed. 32% of women agreed that they were inconvenienced by sanitary waste units when using the toilet and 44% disagreed with the statement. Although sanitary waste units in cubicles are seen by the majority of women as practical, the sanitary waste unit itself is seen as impractical; this is mainly due to its size, shape and location in the cubicle. Sanitary waste units are often placed at the side of the toilet. Many women feel that there is not enough room between the sanitary waste unit and the toilet to allow them to use the facilities efficiently and comfortably (figure 5.16).

Figure 5.16: Toilet with a close sanitary waste unit

One participant described sanitary waste units as *"a nightmare"*, because they *"obstruct the toilet"*. Sanitary waste units are meant to provide a service; it is discouraging that they are seen in such a negative way when the service they provide is of great importance.

Many women commented that they felt the bins are too big for cubicles and their main concern was that they might touch it when using the toilet. It was

also mentioned that the sanitary waste unit interferes with the act of urinating and defecating. If cubicles were wider then these problems would not be so severe. When the results were analysed by age groups they showed that the younger the participant the more useful they appear to be, this could be because younger women menstruate more frequently than older women.

Emotional effect - There were very few positive comments made about sanitary waste units from participants, although it was recognised that they serve a *"real need"* in the community by enabling menstruating women to dispose of sanitary waste without having to take it away with them. However, the comments did highlight the participants' mostly negative emotions towards the units. Most comments revolved around the maintenance of the units; infrequency of emptying them, potentially seeing, smelling and coming into contact with other women's waste (figure 5.17). Sanitary pads and panty-liners are commonly attached to the underwear of the user via an adhesive strip, it is this strip that can sometimes stick on the inside flap of the sanitary waste unit causing 'blockages' thus preventing future users of the sanitary waste unit to dispose of their waste effectively. Women expressed how they do not like to touch it with their hands. They would like to see either a foot pedal or an automated action for opening the lid.

Figure 5.17: Visible problems with sanitary waste units

The main complaint was that women were often faced with other women's used sanitary waste left in the flap; or, were confronted by bloodstains on the flap of the unit; some evidence of this can be seen in figure 5.17. 26% of women prefer using sanitary waste units in public conveniences to a bin at home, while 40% do not. Another complaint was of the smell from the sanitary waste units and that they needed to be emptied more frequently. Automatic and pedal operated sanitary waste units were mentioned by some participants as a

healthier and more hygienic option to hand operated types, due to there being little or no touch contact between the user and the bin. 52%, of women said, they were not pleasant to use, however, a minority of women, 11%, agreed they were.

User requirements - It can be seen from the graph figure 5.18 that women want to see a design that means they are not required to touch the sanitary waste unit this is seconded by the need for the design to be easy to use. As with the toilets and urinals, styling is of lesser importance than the act of interacting with the bin.
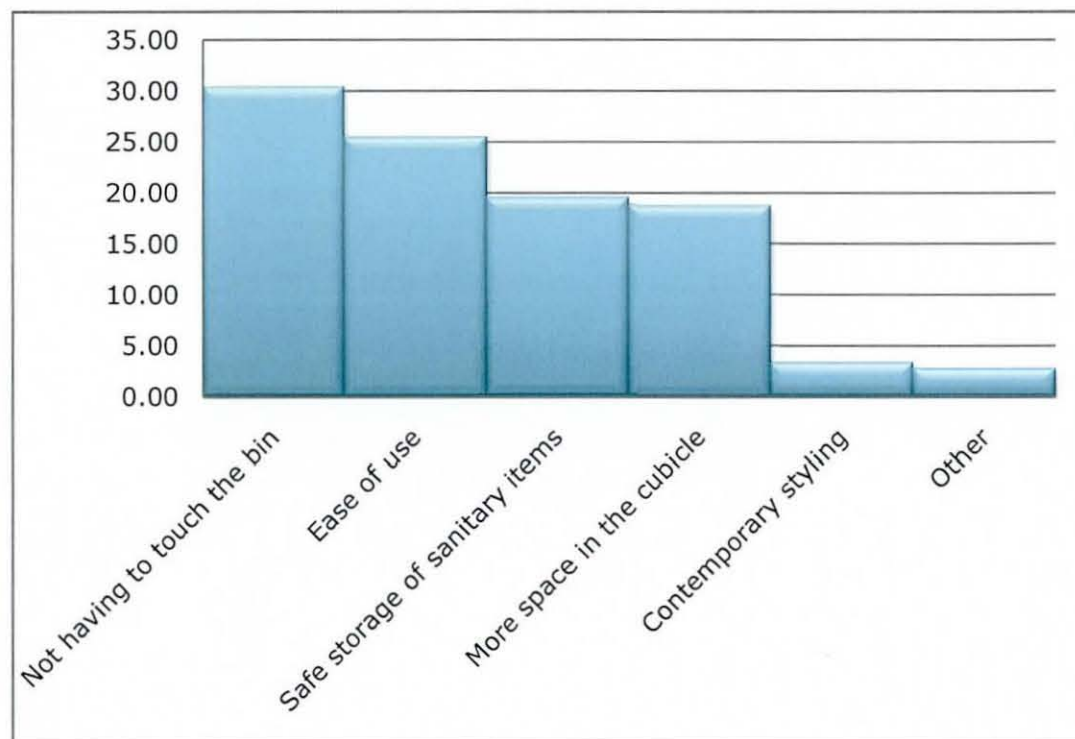
Figure 5.18: User requirements from sanitary waste units

5.4 Limitations

As with all data collection, there are always limitations; the pilot study was presented using only online survey software. The nature of online material means there was the opportunity for the questions, statements and information to be misinterpreted. This was rectified in the main study by rewording and redesigning the surveys to eliminate as many potential causes for confusion as possible. Moreover, online and on-street versions of the survey were designed for the main study and used to aid the elimination of any bias in results.

The target age group of the pilot study was 18 to 65 year old men and women in the UK. Although this is a large proportion of the UK public, it did exclude people outside this age group. It was also felt that the exclusive use of an online survey was not the most appropriate media to gather information needed. Additionally, the 20 to 29 year old age group for both male and female participants was far larger than the other age groups, thus the results from the pilot study may have appeared biased in favour of this age group. These issues were addressed and rectified in the main study. Similar research methodology was employed but was also backed up by introducing on-street data collection. Once the online survey was being hosted, it was possible to see where there were gaps in the group trends; age and gender. It was then possible to try to target these groups by using the on-street surveys.

Both online and on-street surveys were designed to facilitate data collection and to ensure that a good cross-section of society was involved in the research.

5.5 Conclusion

This research aimed to develop a sense of user-product relationships with the specific public use sanitaryware products; toilets, urinals and sanitary waste units, in the UK. The following conclusions are drawn from information gathered from the main study. It has not been possible to determine any specific trends in the user-product relationships with the specific products in relation to age. When the results were analysed in accordance to people religious allegiances there was an indication that those who followed Islam required water in cubicles for personal cleaning but no other trend was detected in relation to religion.

Men and women agreed that public convenience sanitaryware products are generally disliked, unpleasant to use and seen as undesirable items. The main finding from the research was that the most important requirement people have from public convenience sanitaryware products is hygiene. Privacy, both visual and audible is of equal importance to the participants. It is also possible to determine that the emphasis on styling is viewed by the participants as of the least importance as opposed to the functionality of the design.

Both men and women agreed that toilets needed to be hygienic to use. They also need to be redesigned to accommodate the other needs of the users. As discussed, these needs are different depending upon the personal abilities of the user and the users' gender.

Men generally require more privacy, especially audible privacy, than women and the male AP sufferer stated that reduced sound and distance from others was one of his main requirements. Women generally appeared to require more space than men; this was also supported by participants with mobility disabilities. The call for more space was attributed to, by some participants, the lack of space due to the inclusion of sanitary waste units, which are often located at the side of the toilets. Male and female disabled participants said they wanted cubicles to be wider and to offer extra support. Men and women also required new, and possibly gender-specific, designs to combat the problem of splash back from toilets.

From urinals, men require there to be high levels of hygiene and privacy, three of the men who indicated a disability, including the AP sufferer, wanted there to be a minimum of shoulder to knee privacy panels. One of the unexpected results showed that almost a third of men choose to use a toilet rather than a urinal in public conveniences. This is because some men have difficulty using urinals and others feel that they are not private enough.

The design of sanitary waste units also has to be addressed. Women said they were inconvenienced by sanitary waste units when using the toilet as they feel that the bins are too big for cubicles. In addition, women were concerned about seeing and potentially touching sanitary waste left inside the sanitary waste unit by other users.

In order to design more acceptable, accessible and inclusive products it is essential to understand the use and misuse of current products. The needs of the user must be investigated in greater depth in order to develop new design methods and approaches in order that the next generation of public convenience sanitaryware products are more accessible, more emotionally agreeable and physically acceptable to all of the UK public.

CHAPTER 6: INVESTIGATION INTO USER-PRODUCT RELATIONSHIPS

6.1 Introduction

This study involved person-to-person-interviews, using a mixed-methods approach for the data collection. The data was collected using different methodology as previous research had been limited to responses using a Likert scale and mainly provided quantitative data for analysis. To gain the precise information needed to fulfil the research questions (as set out in Section 1.2.3) it was necessary, at this stage, to gather in-depth qualitative data. The results from the interview study provided more complete and in-depth results, this is due to the research methodology applied to this study. It is possible to determine from this study what the users of the public convenience sanitaryware products see as greater or lesser importance, in terms of requirements from the products. Although results from previous research had aided the identification of key areas for further investigation, it was not possible to determine how important these issues were to users. The information sought here was directly linked to the findings from the main study.

Through conducting this study, it has been possible to identify specific areas that have not been investigated in other research. These areas are concerned with specifics of the user-product interaction with toilets, urinals and sanitary waste units. Other research has identified and discussed some of the issues related to these products, but from the perspective of the public convenience block of all 'away from home' public conveniences, and not as individual products in relation to the specific user-needs. Where evidence of this has been found it will be discussed with the findings in this chapter.

6.1.1 Aim and objectives

The aim was to identify the relevant key information to help create a set of design guidelines for designers. The results from the previous studies suggested more understanding of user experiences were needed to comprehend the user requirements of the UK public (see Section 3.5.1). Some trends identified through the analysis of the data apply to both genders such as; requirements for hygiene and privacy, where as others applied exclusively to men or to

women. The design implications derived from the findings indicate toilets are required, by men and women, to be hygienic. However, these hygiene requirements are sometimes gender-specific. It was intended through the completion of the objectives (as shown in Section 3.5.1) that more detailed and accurate information could be elicited. Studies to date only provided an overview of the user needs, where as this study aimed to identify concise information. Thus far, it was known that, for men urinals need to be redesigned to reduce splash back and increase privacy, while for women, sanitary waste units must be redesigned to make them more hygienic and inviting to use.

6.2 The participants

The target group for this study, as with previous studies, was the UK public. The data for the research was gathered by conducting interviews with participants and to audio record the interviews, which were later transcribed. The semi-structured interviews were conducted using a set of pre-determined questions posed to the participants at appropriate times during the interviews. The participants were mainly sourced from the contact details provided by 180 of the 449 participants involved in the previous surveys.

In total, for this study, 12 participants; six men and six women of varying ages were selected to take part (as demonstrated in Section 3.5.4.3). Each participant was given a code according to his or her gender; **F = Female** and **M = Male**, this was followed by a number, which was the age of the participant at the time of the interview; i.e. **F24** is the code for a female participant who was 24 years old. The letter and the number have been used to identify and distinguish different participants during the analysis and discussion of the results. The ideal sample would have provided a good representation of the UK public. However, due to the sample size, the self-selection process of recruiting the participants and the convenience sampling strategy for selecting participants based on their proximity to the interviewer, the sample did not fully represent all of the users of UK public conveniences. However, within the sample group it was possible to achieve a range of different ages and to include certain disabilities that some users of non-disabled access facilities might have (see Section 3.5). It was also possible to achieve a 50:50 ratio of male to female interview participants. The sample group also gave an appropriate amount of data which could be analysed within the time and recourses allowed

for the research project. The breakdown of the participants; religion, disabilities, background and employment status can be found in Appendix 8.

Following the main study (see Chapter 5) person-to-person interviews were conducted (see Chapter 6). The participants were again self-selected and this was done through inviting people, who had previously submitted their email addresses, to take part in this study. Participants who responded were selected depending upon proximity to Loughborough or Coventry, these were places the interviewer could get to with ease and also kept costs down.

6.3 Findings

The data gathered for the interviews was qualitative, it was decided that the most appropriate method of data analysis was to use coding and clustering. For this reason there will be several different sections, these do not necessarily following the themes defined in the predetermined questions, but have been determined by the users' responses to the interview. Coding and clustering facilitated the weighting of the responses to the questions (as demonstrated in Section 3.9). Following the analysis of the interviews, it is now possible to identify accurately which areas of the subject are more important to the individuals and the participants as a group. The results from the men and women's interviews will be discussed either together or separately depending upon the answers. Some of the findings are appropriate to both genders whereas others are more relevant to one group or are gender-specific.

6.3.1 The public convenience; as a block

Public conveniences are often, but not always, located in specific blocks or buildings. To access the facilities it is first necessary to locate where the public conveniences are. Several participants have observed, within their lifetimes that they have seen a reduction in the numbers of public conveniences facilities available for them to use. One male participant remarked that he had noticed closures in his home town of Coventry since he was a child; this in turn has consequently contributed to one of the reasons as to why he does not use them. Other participants commented on being unable to find the facilities due to poor signage.

6.3.1.1 Emotional effect

Creating the right environment for users is essential to encourage product use. As discussed in previous chapters, some participants actively avoid toilets due to several reasons, including amongst others;

- privacy issues
- hygiene concerns
- general usability and accessibility of the products

Some of the emotional effects users' have towards the three products investigated were identified in the main study. Although research into the emotional needs of users has been explored by Tiger (1992), Jordan (2003) and Norman (2005), no evidence is available into the emotional effect multi-user public use products have on the users. It is essential, especially considering how private the task is, that the users needs are researched and then understood. These areas were revisited in more detail in the person-to-person interviews. They are discussed in this chapter, in context specific to a task or action of the users.

Bathroom phobias such as AP are described by researchers in the field as a condition which can be magnified when a sufferer has to use a facility in a public convenience (Soifer *et al*, 2001). Indeed, the triggers that create a feeling of negativity towards the products identified by Soifer *et al* (2001) were similar to the participants negative responses presented in this chapter. Several of the users spoke negatively of using public conveniences and described feeling "*apprehensive*" (F31) about the prospect of using them, other participants said they were "*glad to get out of them*" (F79) once they had finished using them. Public conveniences were also described as to only be used in 'desperate' and 'need to go' circumstances. It appeared that the female participants were more apprehensive and negative about the emotional effect of using public conveniences by saying that they mainly used them out of necessity than the male participants. Female participants also comment that they felt dirty, in a physical sense, when using them. Some of the male participants also spoke negatively about public conveniences and described them as "*places [they did] ... not want to be in*" (M56). This feeling of negativity towards them has resulted in some male participants avoiding using or visiting them. However, men who described actively avoiding public conveniences said that in times of necessity, such as illness, they would use them (M56). Despite this general dislike and avoidance of public conveniences, not all the reports were negative, some

female participants spoke positively about public conveniences and said that "*some are very good*" (F42). One female participant even said that when needs to visit a toilet in a public conveniences, although it does not provide her with an experience she enjoys, having them available to use is "*the best … thing in the world*" (F29) to her. Other female participants spoke about being pleased to find public convenience facilities and having them available and accessible for use. One female participant also described how she discusses the state of the toilet with the person she is with at the time and often comments if it is of a good standard. Female participant, F42, described her favourite public convenience, which is in Stratford-Upon-Avon (figure 6.1) and said that it was recommended to her by a friend. What, for her, made this public convenience stand out was the fact she felt it was clean and well lit, but specifically that one cubicle was left unlocked at night when the others were shut providing access to one toilet twenty-four hours a day.

Figure 6.1: Overnight facility

Other participants, particularly male participants, were neutral about their experiences and described this feeling as "*ordinary*" (M80).

6.3.1.2   Availability

As previously discussed in the literature review providing basic public services, such as access to public conveniences, can help encourage tourism and improve the local amenities available to the communities (Greed 2003b). Lack of access

to accessible public conveniences can affect users' choices, such as, those of using public transport. One male participant (M41) rides a bike, due to this he often carries a cycle helmet and rucksack with him, this was described as affecting his ability to access toilets in cubicles. If people chose not to use these services this can affect the local community and could go against the goals and intentions set down by local government and stakeholders.

It was also important to elicit the correct information to understand how users felt about the availability of public conveniences. Some participants expressed how this preconception of a lack of facilities, or limited accessibility to facilities, affected how they lived their lives. Through conducting the person-to-person interviews, it was possible to determine these concerns were more important to the male participants than initially thought. This preconception that men would not be as negatively affected was partially due to literature which stated that men were to be provided with greater provisions; this is in part due to the designs such as the UriLift as well as reports of the common occurrence of on-street urination (Edwards and McKie, 1997). Through the analysis of the main study (online and on-street study). This had not been possible to determine from the previous studies, however this was now possible to determine as the interview process allowed for more comprehensive qualitative data collection. It appeared that the male participants expressed similar concerns to those of the female participants. From the data gathered, availability of public conveniences was viewed as a shared concern between men and women. This concern was not limited to the number, or lack thereof, public conveniences, but also the availability and specifically accessibility of the facilities placed within the public convenience.

In relation to the numbers of provisions of toilets within public conveniences, some female participants indicated that they felt they sometimes had to wait a long time, ten to thirty minutes, for toilet facility to become available for them to use BSI 6465 Part1: 1994 indeed states more facilities are to be made available to men and women. An explanation for the potential delays for accessing toilets, especially in women's public conveniences, was that people form queues and wait. In addition the time spent in the queues, people using the toilets in the cubicles expect to use the facility undisturbed. This etiquette can be observed in most public conveniences. This can lead to a cubicle being vacated and then remaining unused if the lock is not correctly adjusted as it may still show an 'engaged' symbol on the door, the door can then swing shut giving the impression someone in the cubicle figure 6.2.

Figure 6.2: Empty cubicle; confusing vacant and engaged signs on lock

Therefore, a cubicle might remain unused until someone notices nobody has entered or exited the cubicle for a while. To identify this, it requires a person to approach the cubicle to find out if anyone is, or is not in there. Female participants expressed that queuing and waiting for facilities to become available caused them feelings of stress. Another reason given for women having to wait is "*because it takes women so much longer [to use a toilet than a man] and there is [often] a big queue*" (F38). Stress caused by cubicles 'being engaged' was not mentioned by any of the male participants. A possible reason for this was provided by one of the female participants (F38) who said that "*men have bigger, or, an equal number [of facilities; urinals and/or toilets] which is disproportionate [to women]*". In gender-specific male public conveniences, men have the option of urinals and toilets in cubicles in most public conveniences in the UK. It is possible to predict that this is not a frequent occurrence for men; therefore, it was not something that they felt they needed to mention.

6.3.1.3   Accessibility

It is a general rule that in the UK the public wear clothes and footwear; they also often carry other items such as; shopping bags, handbags and coats, amongst other things. Clothing can also vary depending upon the weather; in the UK there are seasonal changes as well as daily fluctuations, which can also differ according to where you are in the country. Due to these extra personal items being common for users of public conveniences to carry, participants were also asked to describe what types of items they would normally have with them. Obtaining this information gave a better understanding of the obstacles

incurred due to personal items and problems people face when wearing different apparel. If the data collected ignored these facts, it would be incomplete and inaccurate.

6.3.2 Toilets

The needs and expectations of the participants, as users, of toilets in public conveniences were investigated in this first section of the interview. There were seven themes in this section (as shown in Section 3.6.1), each contained two statements, or questions. These themes were;

- availability and accessibility
- privacy issues
- product use
- perceptions and expectations
- hygiene
- usability
- emotional effect

6.3.2.1   Accessibility

The participant's experience of accessibility to toilets in public conveniences was dependent upon how the individual perceives them. Therefore, it is not possible to rate exactly how 'easy' this task was for each participant and to the make a direct comparison between the participants. It is however, possible to establish an individual's emotional reaction to a physical task. In some instances, the body shape and size of the participant may have directly affected the perceived 'ease', at other times external factors such as; being accompanied by their children or by carrying shopping may have influenced the users' behaviour and their perceived levels of 'ease'.

Some male and female participants interviewed said they felt there was sometimes not enough space in the cubicle to enter it comfortably. Some of these participants, particularly female participants, felt the space they were provided with made them feel as though they were being pushed towards the toilet when entering the cubicle due to a lack of turning room. This was then said to heighten the feeling of the cubicle being 'cluttered', consequently this then evoked negative emotional responses from the participants and reduced

their enjoyment of using the toilet, all of this interaction has occurred prior to physically engaging with the product. BS 6465 Part2: 1996 recommends cubicles in public conveniences are larger to accommodate the users extra items, however, there is little evidence to support that cubicles are any larger in an LA public convenience than in a privately provided public convenience.

6.3.2.2   Need

People visit public conveniences for many different reasons and not necessarily for toileting needs;

- urination
- defecation
- menstruation

Examples of these other needs;

- check mobile telephones
- having a rest from activities such as shopping
- criminal activities

None of the latter reasons are why public conveniences are provided. Public conveniences and the products in them are intended to allow people a place to tend to their toileting needs of those of the people they care for. Alben (1996) describes the importance of the 'in use experience' by the users, it is important to involve the users in the design process to assess its success. Due to the evidence collected through the investigations it would appear this process has not been employed for the design of public convenience products.

The participants interviewed indicated the general primary reason for visiting a public convenience was to use the facilities for toileting needs. Users described how they used toilets there are several identifiable stages to this process:

- realisation of user need, participants said they only used toilets in public conveniences if;
  - o   the use was "*need driven*" (M47)
  - o   there was no alternative available
  - o   in an "*extreme emergency*" (M56)
- task to perform on the toilet;
  - o   **urination**- it was felt more visits were made for urination (F29)
  - o   **defecation**- it was felt that less visits are made for defecation
  - o   **menstruation**- to change their sanitary protection
- product use and its affect on user behaviour;

- o **urination**- men said they would use the toilet standing as they would a urinal, or would sit to urinate, whereas women would tend to hover or sit.
- o **defecation**- women described was how they put toilet paper in the bowl before defection to reduce splash back and increase bowl hygiene by reducing scarring (figure 6.3).
- o **menstruation**- women also described menstruation as making them feel "*a little bit dirty*" (F31). To try to make her feel cleaner she would like feminine hygiene wipes to be available so she could freshen up, she indicated she would expect to pay for them.

Figure 6.3: Toilet paper placed in bowl to reduce splash back and scarring

6.3.2.3 Maintenance and vandalism

Participants considered that being able to use toilets, with good levels of maintenance was important. What makes for 'good levels' encompasses many factors associated with the product such as; ensuring they were in good working order, being available to the users, cleaning issues such as ensuring the bowl of the toilet was clean, as well as, the general upkeep of the surrounding area. It has been identified that all of these factors must be at an acceptable standard to the user for them to want to use and then enjoy using the toilet. An observation made by a female participants was, if people found clean and working facilities, then they were be more likely to leave them how they were found. New product design must incorporate easy to care for

products not just by the maintenance and cleaning staff but for the users of the facilities as well.

6.3.2.4 Privacy

Public conveniences, and the products placed in them, are intended for public and not home use. It is necessary to understand this and reflect it through the design process. The design should consider user's requirements beyond those of the physical needs. Through conducting the literature review, privacy concerns of AP suffers were reported in relation to public convenience sanitaryware products. However, this PhD research study highlights privacy issues for many toilet users. Privacy must be taken into account when researching and designing future products.

Privacy is one such area that requires special consideration. The levels of privacy an individual needs can be dependent upon the surroundings in which the users find themselves. A toilet user, in a home environment, may have different privacy needs to those if they are in a public space. Therefore, it should not be presumed that a design for the home would transpose appropriately as a solution for a public place.

Privacy was identified as focusing on three main areas;

- **smell**; privacy from smelling other people and being smelt
- **sight**; privacy from seeing other people and being seen
- **sound**; privacy from hearing other people and being heard

Privacy of smell - Odour was said, to be potentially the first thing people might notice about a facility. The male participants who spoke about smells associated with public conveniences said that, as users, they were emotionally influenced by the smell of the facility. Negative smells in public conveniences were attributed to creating negative reactions from participants associated smell with hygiene and replied, when asked what for him created a sense of hygiene, "*or destroys a sense of hygiene, is the smell*" (M41). Some male participants also said that they would prefer there to be an absence of smell and that if a public convenience smelt neutral, thus this was said to help contribute to creating a positive toileting experience as the facility would be perceived as 'clean'.

One way that was suggested to eliminate negative smells by installing additional automatic air-fresher units in each public convenience block. Kira (1976) noted that the smell of a public convenience could be concealed with another scent, but it could be that this 'new' smell might evoke similar negative emotions. Although air-freshener was said to sometimes help improve the ambient odours within the public conveniences, the 'new' smell would need to emit the desired types of odour. They continued to say that strong smells, such as disinfectant were off-putting. Male and female participants also suggested improved ventilation systems to better the toileting experience. This is potentially attainable, in some public conveniences, by the addition of windows or air vents to increase ventilation. These in turn can create a more positive atmosphere by allowing more natural light into the public convenience block.

Privacy of sight - Visual privacy did not appear to be wholly restricted to the need of preventing the participants from being seen by other users. It also appears important to the participants not to see other people. Again this is discussed in the literature by researchers into AP (Soifer, 2001) but not with respect to the general public who do not necessarily suffer from AP. This may appear obvious, as people may not want to see others 'going about their business,' but this need for visual privacy goes beyond a person physically 'being present'. People expressed how they did not want to be reminded that they are in a public place and particularly that other people have had access the facilities and had used them. Participants understood and accepted that public conveniences are for public multiuser use and that they needed to share the products, but they were generally all in agreement that they did not want to touch anything other people had previously used.

Having a visual barrier, be it physical; cubicle dividers and doors, or less tangible; removing evidence of others having use the products before, can be partly achieved, for some, through providing visual cleanliness and hygiene which is essential to many people in creating a pleasurable toileting experience. *Splash back -* Liquid; urine or water, found on the seat or on the floor was a concern for many of the participants. They commented how they did not like the look of liquid being outside of the bowl, as it made them feel as though the products were dirty. If the products were dry, it is believed that users would not feel so negative towards them. For one female participant (F31) said that even if she knew the liquid was 'clean' she would still feel negative about her toilet experience as it was the sight of the liquid that displeased her.

Faecal scarring - Whist interviewing the participants in relation to privacy needs, urination and defecation came up as topics to talk about. Most people were comfortable talking about urination, however, talking about defecation cause some 'humorous' responses. Despite this reluctance, from some participants, to speak about defecation they still answered the direct questions posed to them, but some did not offer any additional information, whereas others are did. Of the participants who willingly spoke about faeces and its effects on their toileting experience, M41 said that seeing faeces, especially not belonging to him, was something that repelled him. Faecal scarring of the toilet bowl was not something many of the participants spoke about. However, this may be due to the nature of the sensitivity of the subject.

Privacy of sound - Male and female participants expressed the need for improved audible privacy to prevent and/or reduce the chances of hearing other people, either waiting to, or using the toilets. A way to increase this privacy suggested by participants was to provide a vacant cubicle between each stall to increase privacy of sound (M56). Having sound barrier was also said to make participants feel more relaxed specifically when defecating in public (F31). Male participants said sound privacy was for them, "*more of a factor in cubicles than it is [when] using urinals*" (M26), and that a lack of audible privacy could be "*a little embarrassing at times, when hearing other people*" (M56); this subsequently reduced the enjoyment of the toileting experience.

One suggestion for improving privacy of sound was to create a 'sound cover' by playing music in the public convenience block and this has been observed by one male participant whilst in Austria and, depending on the music played; felt that this could prove effective at creating a more enjoyable experience (M56). Female participants also spoke of methods they employ to create this 'sound cover'. Female participants described turning on taps, when she can, especially if she needed to defecate, to disguise any associated toileting sounds (F31), and how she also uses the "*the American privacy flushes*" (F29), as a way of providing sound barrier when using the toilet; as well as using hand-dryers to cover any sounds.

Audible privacy and material selection - The materials used to make toilet pans and the effects of these materials on the toileting sounds was spoken about by one female participant. She said that she felt stainless steel panned toilets spread sound, whereas toilets made from ceramic did not necessarily have the same effect.

Sound privacy conclusion - Similarly to the visual privacy, there is a need for people to not be reminded that others are using the same facilities. Providing effective soundproofing could be difficult to achieve in public conveniences, as there are other space and cost issues. However, effective design could be used to reduce the effects of sound dissipation.

6.3.2.5   Use

There are two main parts to a toilet; the bowl, and a cistern. On top of the bowl there is normally a seat. Toilets, in public conveniences are generally installed with a seat and this can come with or without a lid, there appears to be no reason for this, and the cistern. The cistern is usually also the place where the flush is located; this can be on the top or on one of the sides of the tank. Most home toilets are similar in these respects.

Toilets in the home and those found 'away from home', including public conveniences, are often of the same generic design apart from the seat lid where the general rule is toilets in the home have a lid. The user, in a public convenience, has to decide what to do in relation to using the product, including the seat and the flush; to use as intended, or not. Some people alter their product use, due to it being a public convenience sanitaryware product. As a result, there are often cases of product misuse; this can then lead to other problems. Misuse in this context does not refer specifically to vandalism, but is more concerned about toilet usage and it not being used as intended by the designer.

6.3.2.6   Bowl design

There is only one generic design of the sit-type in the UK but it comes in small variations, however, some of the participants have noticed large differences between those found in the UK and abroad (as explained in Section 2.7.1.1). It was mentioned by one male participant (M60) that the bowl design he saw in Slovenia was a better shape to accommodate the removal of faeces in comparison to toilets found in the UK. The bowl shape was described as a 'ski slope'. This slope design of the bowl was said to allow for more effective flushing and he said that faeces were efficiently removed without any of the associated 'scarring'.

Other participants spoke of Western European toilet design, specifically from Germany and Austria, where the bowl was described to have a 'shelf'. This shelf is where faeces would rest and then allowing users to inspect it prior to flushing. It is believed by one participant that the shelf design helps counteract some of the issues associated with splash back. As observed by the participant, users can, with the aid of the shelf, clearly see their faeces, she reported how there are fewer cases of rectal cancer in Germany and Austria than here in the UK however this is not true according to a survey published by Cancer Research UK in 2002 (2009) (figure 6.4).
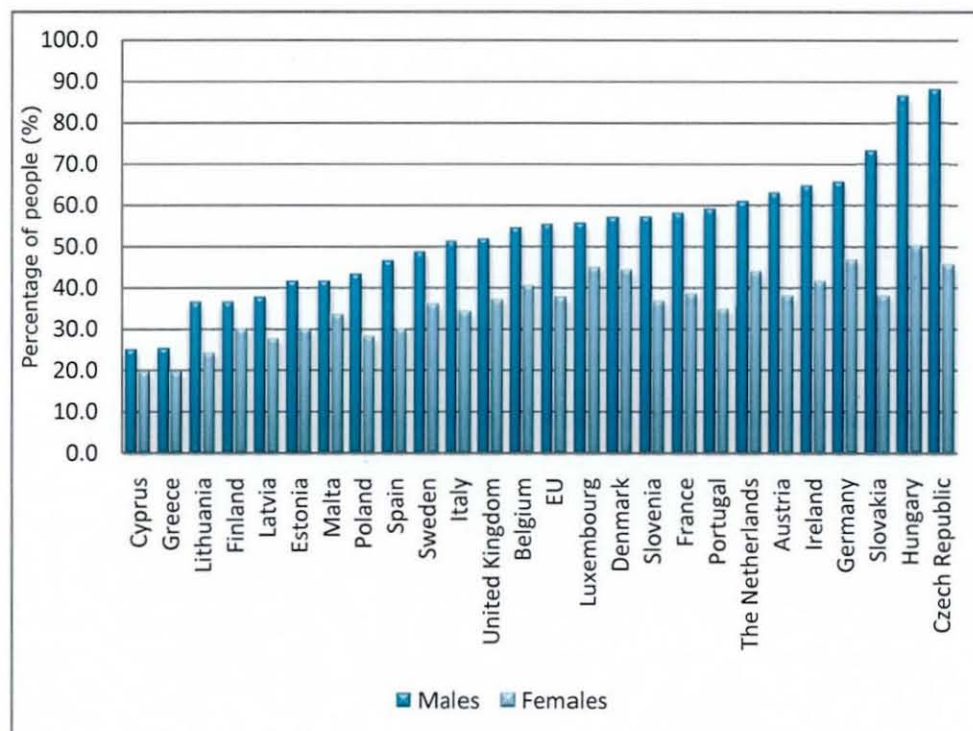
Figure 6.4: Age standardised (European) incidence rates, bowel cancer, EU countries, by sex, 2002 estimates (Cancer Research UK, 2009)

6.3.2.7 Splash back

Splash back is liquid, urine or other, seen on and/or around the toilet including the seat and floor. This can be caused by flushing, dropping items in the water or from users not aiming correctly at, or missing the bowl. Splash back, was specifically mentioned as a problem by several of the participants. They said that the sight of splash back made them feel as though the facilities were unhygienic, they described how the effects of splash back made her feel

"*horrible*" (F42) and that said seeing it could make them look to use another toilet (F24 and F79).

Splash back is not just something people see, but can be something they experience during toilet use. This is where urine or faeces can hit the water causing a splash back. As mentioned in the 'toilet paper' section several participants described how they have adapted their behaviour by placing toilet paper on the inside of the bowl to counteract its effects. One male participant, who frequently uses toilets standing up and facing the cistern for urination, said that he aims at the 'inside side' of the toilet bowl to reduce splash back (M60). He described how if he aims at the water this is likely to cause splash back. However, some male participants said splash back was a lesser problem when using toilets as opposed to when using urinals. A reason given for splash back from toilets was attributed to the shape of the bowl. Not all participants said, when asked, that they experienced problems with splash back (F79).

6.3.2.8 Toilet seats, seats with lids or nothing?

It is essential to know, for research, concerned with user-product interaction, how the participants use the toilet facilities (Appendix 9). It was also important to establish how people not only wanted toilets to appear to them, but also how they use existing facilities. Participants were asked whether they would prefer to use a toilet with a seat and a lid, with just a seat or nothing, it had not been possible to gather specific information about these user needs of toilet seats and/or lids and seats through the literature review or elsewhere. Many of the participants had different views about this so it is not possible to say which solution would answer the public need the best, a solution that would allow for the individuals choice would possibly be the right solution.

Participants also said toilets with only a toilet seat and no lid looked to her to be "*unkempt*" (F29) and M26 said that he thought that toilet seats, even if they were provided without a lid, "*demonstrate a higher level of care and hygiene*" (M26). Toilet seats were also said to be make the toilets look better.

Other participants were more specific about the issues concerning toilet seats and what was important to them. Several participants said they prefer not to have to touch toilet lids on toilet seats. They continued to say that if they used a toilet with a lid and seat they would want to have the lid already up this was to avoid any touch contact between themselves and the product. One male

participant said that public toilets seats provide places bacteria can reside because of this, his preference would be for a toilet in a public convenience to be presented without a toilet seat this preference was also shared by other participants. However, despite some of the participants own personal preferences of not sitting on toilet seats one expressed the need for them as some people need to use them (F24).

Other participants were unconcerned about having a toilet with or without a lid. This questions the effectiveness and purpose of toilet seats in public conveniences. The general consensus was that having a lid and seat made the toilet look complete but if it is not used, or if it hinders the product use, is it worth installing such items. However, this decision must take into consideration the weighting of the arguments, for and against lids and toilet seats.

As expected, several of the participants said they did not sit on toilet seats when using toilets in public conveniences. The general feeling was that toilet seats were not clean and several participants who described the state of the toilets seats as poor. These issues, which are concerned with product hygiene directly, influenced the use of the seat. If users felt there was a lack of hygiene they may choose not to sit on toilet seats. The male participants said they would use the toilet standing, hovering or sitting and it was said that for men it was easier to use toilets for urination, as they have the ability to stand and urinate, than it is for women. Women indicated that they tended to either sit, or hover over the seats. One female participant (F31) mentioned she sometimes crouched with her feet on the seat to avoid touching it this practice has also been observed in the male facilities, one male participant (M41) said that he had sometimes seen footmarks on the seats.

Most of the participants who said that they sat on toilet seats said they wiped them with toilet paper before sitting down. Some participants do not just wipe the toilet seat but said that they always places toilet paper on the toilet seat before sitting down, this creates another barrier between the user and the product. Other participants expressed their fear of "*things [germs] on the toilet seat*" (M56), and was concerned about the transfer of germs onto his body. Participants clearly expressed negativity towards touching something other people had used and were specific about toilet seats in this respect. However, other participants said this practice would depend on the material the seat was made out of and if it was made of wood, they would cover it with paper and

then sit, but would just wipe it and then remove the paper and sit down if the seat was made from a polymer (M80).

Wiping the seat with toilet paper appears to be a common practice for people having to overcome problems with splash back on the seat. One female participant (F31) believed infections (diseases), such as vaginal inflammations, could be passed on by using toilets other people had used and others described how seeing splash back on seats made her feel disgusted if someone had urinated on the seat and then she had to use it.

A way of partly overcoming this feeling of negativity towards toilet seats is to provide users with seat covers, sanitizer sprays and disposable disinfectant cloths as an option to improve the usability of the toilet seat. Men also mentioned the underside of the seat as dirty, and lifting the seat by hand was not a pleasant task, this is not necessarily apparent to other users if the seat is down. When participants spoke about being provided with the extra items; sanitizer spray, toilet seat covers etc ... they said that they felt the providers of the public conveniences had considered their needs as users and consequently made the toileting experience more enjoyable.

Toilet seats and vandalism - Participants also spoke of the resulting design changes to toilet seats due to vandalism. One of these changes noticed was that toilet seats are sometimes were bolted onto the toilet bowl (figure 6.5). Another participant said that if facilities were still available for use and to an acceptable standard of hygiene, he would still use them regardless of if they had been vandalised or not (M26), however, this was said to possibly change with age (M26). Not everyone thought that vandalism was a problem and it was observed by one male participant that vandalism *"appeared to be on the downward trend"* (M80) in more recent years.
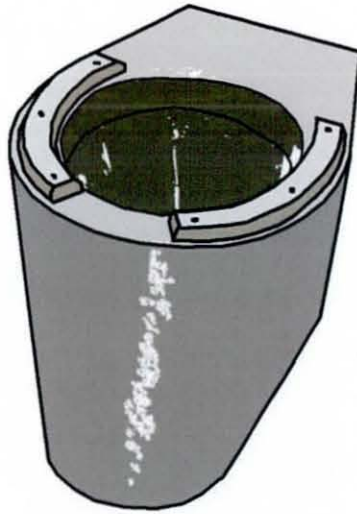
Figure 6.5: Toilet with bolted down seat

Toilet seats and material selection - It is important, as with any design, which is intended to engage the user, to consider what material the product will be made of and its aesthetic qualities. Most toilets available for public use in the UK are made of either vitreous ceramic or, stainless steel. Appendix 10 shows what the participants commonly found in public conveniences and how this made them feel.

Toilet seats or toilet seats with lids can be made from different materials and in a variety of colours. Most of the participants said they commonly found white or black plastic seats. Participants were also asked for their opinions about the colours and materials they would like seats to be made of; the majority replied, white plastic.

Polymer; The reasoning some participants liked polymers seats was because they felt it was easier to determine the cleanliness of the seat. Some participants asked for a gloss finish to the seat, again to facilitate them when making visual hygiene inspections as they felt a gloss finish would aid them in deciding to use the toilet in the cubicle or not.

Wood; Wooden toilet seats were mentioned by several participants, some described them as evoking a higher standard and encouraging emotions of cleaner toilets. However, one male participant (M80) was very negative towards them and recalled how they used to be commonly found in public conveniences and he felt they were unhygienic and not as comfortable as the polymer seats.

6.3.2.9 Hygiene

Many participants commented, during the interviews, about the levels of hygiene they had observed in public conveniences. By using the artefacts if was possible to have all the participants thinking about the same products, however, it was not possible to have all participants viewing them as all having the same level of hygiene. All the cards showed monochrome images of 'visibly clean' facilities as everyone has their own personal standards of hygiene. What might be acceptable to one person is not necessarily to another. Some participants commented on positive, while others commented on the negative aspects of toilet hygiene. A common theme shared amongst the participants was a need for acceptable levels of hygiene. This was supported by researchers such as Greed (1995) who advocate the need to re-introduce the toilet attendant. Yet this research does not cover the direct user-product interaction, it is more concerned with the public convenience as a block.

For male participants, hygiene issues were spoken about specifically in relation to the act of sitting on the toilet seat. In certain circumstances using toilets in public conveniences concerned them and made them feel "*very uncomfortable*" (M26) he said he avoids using toilets and specifically sitting on toilets in public conveniences due to hygiene concerns but he would not "*harm*" himself in order not to use one. Several male and female participants described their experiences of public toilets as 'poor' or stressful due to insufficient hygiene levels. Others spoke of 'picking up' germs and infections from toilets and even described toilets in public conveniences as "*dire*" (M60) in terms of the general state of cleanliness and hygiene. The design of the toilet must encourage proper use to be cleaner.

Public toilets were described by other male and female participants as 'good' from a hygiene perspective. One male participant (M41) said he generally did not have any concerns about using toilets in public conveniences. It is not possible to say what this fluctuation in acceptability of toilet hygiene is attributed to, perhaps it is dependent upon the location and town, what resources are available and again, personal perception. One reason suggested was that people are "*beginning to appreciate*" (M80) the facilities and it is this which is increasing hygiene levels.

6.3.2.10 Safety

Issues surrounding user safety were mentioned by several of the participants. These concerns were more specifically to do with the users' physical safety and that of their personal belongings, rather than regulated Health and Safety concerns. For women safety concerns were mainly to do with personal belongings;

- shopping
- coats
- handbags
- amongst other items

Most of the women concerned with these issues said they would require there to be a hook on the back of the door or in the cubicle. They said that when a hook was available they used it, figure 6.6. Some of the female participants also expressed concerns about hooks on the back of the doors and due to these concerns some of them do not use them. The concern was, people, exterior to the cubicle, could 'snatch and grab' items hooked on the inside of the cubicle doors if there were gaps at the top of the door. As the user, to whom these items belonged would be in the cubicle and presumably using the toilet facility, would find it difficult to then chase and/or catch the perpetrator.

Figure 6.6: Hook being used for coats and bags

One possibility to reduce the risk of the 'snatch and grab' scenario and the feeling of vulnerability when using a toilet in a cubicle such as this, would be to move the hooks from the back of the door to the cubicle divider wall. This would be beneficial in three respects;

- it may prevent and/or reduce 'snatch and grab scenarios'
- it may encourage hook use
- it would potentially allowing users access to bags should this be required

Participants mentioned they sometimes need to access their bags; for instance if reaching for a tampon or sanitary pad, or is just checking mobile telephones. Therefore, it would be beneficial to provide easier access to bags hooked inside the toilet. However, if a hook was unavailable, some of the female participants said they might use the toilet whilst keeping hold of their personal belongings so that they are attached to their body if they could. Other users put items on the floor, this too raised safety issues as they can also be grabbed if there is a gap at the bottom of the cubicle doors and dividers.

Men had different concerns when using public convenience toilets to those of women. They were more concerned with personal physical safety and were worried about assault, sex crimes and drug related crimes. It had also been noticed that a few public conveniences have a design feature believed to be a direct result of vandalism issues, it was observed that many have concealed cisterns figure 6.7. One male participant (M60) said cisterns were places people use to conceal contraband. He said he would prefer concealed cisterns because of these concerns.

Figure 6.7: Toilet with a concealed cistern

6.3.2.11 Flushes

There are four main types of flushes, **infrared** (IR) (figure 6.8), **push** (figure 6.9), **handle** (figure 6.10) and **chain** (figure 6.11) not all of these are common in public conveniences; however, it was important to discuss at all four to establish user preferences. No evidence was found in the literature that discussed how users used flushes, why they used them, when they did, and what affects their choices of how to use flushes in relation to achieving their desired results.

Figure 6.8: Toilet with IR flush

Figure 6.9: Toilet with push flush

Figure 6.10: Toilet with handle flush

Figure 6.11: Toilet with chain flush

Using the flush, general issues - Participants were asked during the interviews what their requirement of a toilet would be, flushing and the consequent removal of waste was said by several of the participants to be one

of the most important requirements. It was also said that it was important for the participants to know when they left the toilet it had been successfully flushed. Flushing was something, which appeared to be important to both male and female participants. Most people said they flush the toilet after they have finished using it as the last interaction with the product before they get ready to leave the cubicle.

Some participants described some of their personal habits and preference when flushing. One female participant (F31) said how she continues to flush until there is a smell of water. In addition to this she would like a high power flush to ensure the bowl is cleaned effectively. In her home country, Portugal, there are, what she described as, '*tube*' flushes. These are high-pressure flushes that use a small amount of water but provide effective removal of waste in the toilet bowl.

6.3.3 Different types of flushes

Infrared flush (figure 6.8) - IR flushes allow the users to flush the toilet without having touch contact. The IR flush can be activated when an object moves near it; it is intended to be activated by the users moving their hand in front of the sensor.

From the data collected the participants indicated a preference for the IR flush and it was described as "*the ultimate*" (M27) flush. This preference was shared by several participants who viewed them as being more hygienic to use than touch contact flushes as IR provides a practical solution as it involved no touch contact between the user and the product. Participants who had never used the IR flushes, but knew about the technology realised this as a potential advantage.

One female participant (F31) said, in relation or IR flushes, that she wanted flushes to be as "*less techie as possible*" (F31). She continued to say that if the product interaction became automated, the toilet designer must be mindful not to complicate the process for the users. This concern over toilets that were 'too technical' was shared amongst other male and female participants, one said about a trip to Amsterdam made in 2007, how she found using the IR flush to be complicated as it was not clear how to activate them.

IR flushed were also said not to be the ideal choice for one female participant as she required repeat flushing (F31). The need for repeat flushing is not

necessarily an issue with the flush interaction but is concerned with the refill time of the cistern, unless there is enough water in the cistern it will not flush; this is not dependant on the way the flush is activated. She had previously stated in the interview that she flushed to 'cover up' toileting sounds and to create a fresh smell of running water. It is believed, in this instance, that it is not the flush that is the issue for her but the way she uses water to aid with her toileting comfort.

Push button flush (figure 6.9) - Push button flushes were seen by some people as a good option as they can be activated with minimal touch contact between the user and the product. With push flushes it is also easy to incorporate a short and long flush cycle; this was seen by some as a good idea as it conserves water and allows people to determine which pressure of the flush is required. Flushing was described as sometimes being unsuccessful and that having a choice of flush pressures, would help overcome this. However, one female participant (F38) has a dual flush on her home toilet and she is unconvinced as to the effectiveness of the system and believes people just press the button without considering which flush cycle they need. Water conservation and environmental awareness should be included into all new designs.

An argument against push button flushes was directly related to hygiene concerns and cleaning issues. As the button is pushed, into what is effectively a hole, it is not necessarily always possible to wipe the exterior of the button clean is the top of the button is flush with the cistern or wall where the button is located. The button would have to be depressed and then the inside of the button holding would be wiped, however this does mean the outside of the button would not be cleaned.

Handle flush (figure 6.10) - Handle flushed toilets are normally activated by the user pushing down on the lever with their hand. Again there was the issue of touch contact here and some participants described alternative ways of flushing one female participant described how she uses her foot to flush the toilet, another said that she uses her elbow to activate it.

Chain flush (figure 6.11) - A chain flush works similarly to a handle flush but usually the cistern is located high up the wall therefore the handle flush has a chain attached to it and it is this chain that is pulled. Three participants said they did not like chain flushes and put this down to them being 'old fashioned' and having maintenance issues. One male participant (M26) also said that a pull

chain would make for a negative experience due to the difficulties associated with activating them.

6.3.3.1 Toilet paper use

Availability of toilet paper appeared more important to women than for men. This is possibly because of the physical differences between the genders and how these differences influence the way people used toilets. Men did not indicate a need to wipe after urination, whereas women did, both genders indicated a need to wipe after defecation.

Toilet paper is an additional product commonly found in public convenience cubicles accompanying toilets. Toilet paper is used for a variety of reasons. It is not employed exclusively for wiping personally after toilet use. More *et al* (1991) found that women used toilet paper to cover toilet seats prior to sitting down. Some participants explained how they use it for other activities;

- mainly to prevent or reduce contact between themselves and the toilet by wiping the toilet seat before use
- placing toilet paper in the bowl prior to use so that toilet paper would act as a cushion to counteract the effects of splash back
- to lift up the toilet lid and when activating the flush

Some participants said they always carried their own supply of toilet paper in case there was none available.

Types of toilet paper dispensers

There are commonly two types of toilet paper available; rolls and sheets. Due to the type of paper, different dispensing methods can be used. Having toilet paper available was weighted as more important than the dispensing method. Some participants indicated preferring different methods of dispensing toilet paper. Some wanted to have toilet paper on a roll and not leaves, the rational for this was that the difficulty of accessing leaf toilet paper from the dispensers resulting in corners being torn off, thus littering on the floor making the place look "*untidy*" (M41) (figure 6.12).

Figure 6.12: Litter resulting from toilet paper

It was also observed that toilet paper dispensers can sometimes take up room within the cubicle as they are often placed on the divider wall. He described how on occasions he had found dispensers on the back wall and found it awkward to reach when using the toilet (figure 6.13). He explained how he had consequently changed his toileting behaviour to accommodate the layout of these types of cubicles. Instead of using the toilet seated and then reaching to the back wall for toilet paper to wipe, he now takes toilet paper from the dispenser prior to sitting down on the toilet.

Figure 6.13: Toilet paper dispenser on back wall

There was also a discussion as to the type of toilet paper provided. People said they accepted the paper would not necessarily be of the same quality which some are accustomed to in their homes, but asked for the toilet paper to not be of the 'rough' type.

6.3.3.2   Influences of user behaviour

Life experiences were seen to influence people's behaviour. This can be self-directed, or from an external source such as family members, as a result of, for example Islamic faith it is common to practice a partial ablution after using a toilet (IOLTeam, 2003), and the culture in which people live in. Some of the participants said they had felt their toileting habits were positively influenced by their parents as proved in by Moore (1991) where instructions from the women's mothers had guided and directed toilet use, and in particular their mothers. Other participants indicated that their behaviour was an opposing reaction to how their parents reacted towards them.

Women tended to speak of how they learnt to use public toilets form their parents, particularly their mothers. Female participants also mentioned how they in turn had influenced and/or guided their children. Female participant (F38) recounted a story of how, in a public toilet located at a tourist attraction, she told her daughter not to sit on a toilet seat as it was too dirty. Misunderstanding this advice, her daughter put her hands on the seat and lifted herself up. F38 described this as being worse than if her daughter had sat on the toilet seat, as there was not adequate hand washing facilities available. It was not possible to determine is if the child had a clear concept of hygiene or not. However, this event has influenced how the mother now explains toilet practice.

Age can also be an influencing factor when considering product use, especially when it involves physical interaction. One female participant suggested that toilets should have little seats on them to stop the child falling down (F29). Although nobody commented specifically of an infant or child falling into a toilet this need for smaller seats was a recurrent theme, especially with the female participants. Full sized toilet seats are sometimes too big for infants and young children as is the size of the toilet bowl. Some ASDA® stores have installed toilets of children with lower down and smaller toilet seats and bowls this is accompanied by low sinks. Mothers also described difficulties of taking children to the toilet as they often have many layers of clothing on and that there is a need to undress the child before they use the toilet (F38).

Some participants said when they were younger they were probably less concerned with hygiene issues and this has changed with age. Others described

changes with product interaction between childhood and adulthood one male participant (M41) would not use the public toilet for defecation as a child, but he would do so now, as an adult.

6.3.4 Urinals

Men are often provided with toilets and urinals in public conveniences. The urinals are often made of ceramic and are individual or are made of stainless steel and are trough shaped. Urinals are not found in female only public conveniences. The male users' needs and expectations of urinals in public conveniences were investigated in this section of the interview. There were four themes (as presented in Section 3.6.2);

- product use
- product preference
- privacy issues
- user requirements

Each theme had two statements for the participants to respond to. The general consensus of the preference the users had for the urinals was to have individual urinals but "*designed better*" (M41), as in to reduce splash back and increase privacy.

6.3.4.1   Product choice

Men were also asked, not just which style of urinal they would prefer but also if they would prefer to use a toilet in a cubicle or a urinal. It was possible to determine that there is a definite split in preferences. Most men agreed that they use urinals, be they made of ceramic or stainless steel, although some had preferences between the two. Also, some men definitely preferred to use a toilet for urination as they felt is offered them more privacy and security than if they were using a urinal.

Stainless steel trough urinals - Stainless steel urinals are often found in trough shapes and were described as giving an aesthetic "*semblance of modernity*" (M56). The rational was that the space has to be bigger to accommodate a trough urinal and due to the trough design, more people can use it, rather than individual urinals where the number of users is limited by the

number provided. This preference for stainless steel was not shared by all participants, and they described tough urinals as tending to have "*urine residing in them for a period of time*" (M60) and this being unpleasant and "*more of a problem*" (M47) to use when urinating than ceramic urinals.

Vitreous ceramic individual urinals - The general preference of the users was for individual urinals; one of the reasons they were preferred was because they were described as being cleaner than the trough urinals. M80 said the individual ceramic urinals would be his preference out of the two styles available, but that he had no issues over using the trough urinals.

Participants expressed a need for individual urinals to be "*better designed*" (M41) this was because participant felt that individual urinals cause splash back. Other participants said that they felt ceramic urinals provided better protection from splash back, therefore making them easier and cleaner to use.

There is no actual evidence to suggest that ceramic is any cleaner, or reduces splash back and therefore a better material for making urinals than stainless steel. This difference could be attributed to the design, and consequently to what is achievable with the materials. Ceramic can be easily manipulated and cast into different shapes; this could be advantageous in creating a surface that would reduce splash back.

Alternative facilities - Besides the aforementioned styles of urinals, there are other alternative urinal designs sometimes available for men to use in public conveniences, or other 'away from home' facilities. The most commonly mentioned alternative was of the Victorian urinal, figure 6.14.

Figure 6.14: Victorian urinal

Victorian urinals were viewed by two participants as a good design solution as they were said to counteract splash back and due to their design they were able to be used for men of varying heights, as well as children. One participant mentioned a negative respect of the design was that urine droplets can sometimes land on the users' feet when using them, he found this undesirable.

Male participants were also asked about chemical or waterless urinals, figure 6.15. The male participants said that they had not noticed them being particularly different in functionality to flush urinals and, that as long as they worked, then this was also an acceptable solution.

Figure 6.15: Waterless urinals

6.3.4.2   Privacy issues

Some male participant specifically mentioned preferring to use individual urinals, as opposed to the trough urinals, because "*you just have better privacy*" (M80). He said the best solution for his needs would be to use a toilet in a cubicle, but he often found that they were occupied; therefore he would use a urinal. He does not have any problems with other people being present when he is using a urinal, only his preference would be a cubicle.

Privacy of sight - Urinal dividers are installed in some facilities, most commonly at individual urinals, as a way of providing users with more privacy, or as splashguards from other users. Participants were asked about their views on them, these were varied. One male participant (M60) also expressed how he did not see how some urinal dividers provided extra privacy as they were often short and he viewed them as splash screens. Some male participants said that he would prefer to have privacy panels, even if they are the small ones, i.e. splash screens, than nothing at all and it was said by several participants that

dividing screens were beneficial as they create a sense of increased privacy and greater *"reassurance"*. One participant (M60) spoke of his need for greater visual privacy as he was concerned people may look at his genitalia when he uses urinals and privacy panels would help as there is less of a chance this would happen therefore larger dividing screens would prove beneficial (figure 2.11). However, despite this preference, generally, male participants said that they did not necessarily require them but it would be beneficial to have them. Female participants also expressed that they would prefer not to see men urinating if they had to use a unisex facility.

Men also mentioned that sometimes they see debris in the urinals; chewing gum, cigarette butts, amongst other rubbish. They also had general maintenance concerns, these consisted of dirt on the floor near the urinals; salt deposits on the underside of the urinals, on the pipe work and on the floor caused by urine. These salt deposits and watermarks on the floor were attributed to leaking. One of the design criticisms of urinals was about the piping being on show. Male participants said that they felt this was a place where *"bacteria [could] sit on the actual pipe work"* (M60).

Privacy from others - The male participants indicated a preference of not having other people present when they were urinating. Participants said that they felt using urinals in public conveniences inconvenienced the other people waiting. Women also expressed concerns over the levels of visual privacy provided by a urinal, specifically if it was to be a unisex facility they did not want to see men urinating in front of them. Several participants indicated times when they felt a lack of privacy had both a physical affect on them; being unable to urinate and a psychological effect; making them feel inadequate. However, if the room was empty they generally were able to urinate at urinals.

Privacy of space - The need for personal space, to facilitate user comfort was constant thought the interviews. This was one of the main reasons people chose to use, or preferred to use either individual or multiuser urinals or a toilet in a cubicle.

Some male participants also said that they were not concerned about having other people present when they used the urinal. However, they described how they would *"definitely leave one [urinal] free"* (M26) between themselves and another user as this would provide greater privacy. It was suggested that a minimum of one meter should be provided between each user. This need for personal space was one of the reasons why one of the participants (M47)

preferred using individual urinals to trough urinals. Yet it was for these same privacy and space concerns that one male participant (M56) preferred the trough urinals because he felt that he was provided with the ability to choose the space between him and the next person.

This preference for screens was shared by many participants though these were for different reasons; mainly extra privacy of sight and greater personal space.

Privacy of smell - Urinals, and the associated smells, were mentioned by several participants as 'off putting'. M80 said he had observed that the smells associated with urinals have improved through the years and he attributed this to more efficient flushing. Female participants have little or no experience of using urinals, but they did comment on the smell of urine in male public conveniences as being unpleasant.

Privacy of sound - Similarly to the toilets sound, urine hitting the urinal, was also said to be a concern for users of urinals in public conveniences. One male participant (M80) said that he felt ceramic produced less sound than stainless steel and due to this his preference for urinals was that they would be made from ceramic.

Product use - All the men interviewed said they used urinals for urination. No indication was given for any other use of the product.

6.3.4.3   Splash back

Splash back, as with toilets, was also of concern amongst the male users of urinals. Some male participants expressed concerns associated with splash back at urinals and said that the severity of the problem can be dependent on the design of the urinal. Participants also described how they aim the trajectory of urine stream into the urinal in certain ways to try to avoid splash back. It was said that if the urine trajectory was aimed at the side of the urinal, for a ceramic individual, and the back wall at the bottom of a stainless steel trough urinal, in general, this would help reduce the effects of splash back. However, not all participants said that they experienced problems of splash back at urinals (M56).

6.3.4.4 Emotional effect

Personal safety was mentioned as an issue when using urinals. Some participants were concerned about being assaulted for their personal belongings; laptop, wallet, mobile telephone amongst others. One participant described how he felt physically vulnerable when using a urinal, this concern was associated to the arrangement of the urinals as they are designed to be used facing a wall, as such, he cannot necessarily see who was behind him.

6.3.4.5 Usability

The height at which urinals are set was said to be potentially problematic especially for children or shorter men. One participant (M56) said that because of this, he finds that individual ceramic urinals are sometimes difficult to use because they can be set quite high up the wall. Male participants commented on how individual urinals sometimes have one lower urinal made available at the end of the row. This was seen as a good solution to the height problem.

Participant, M80, said how he remembered the change from multiuser Victorian styled urinals to the individual ceramic urinals, and felt the lower down urinal was an afterthought, as when they were originally installed, this was not the norm. Trough urinals were commonly observed by participants to be set at an almost horizontal plane, thus there is no variance in their height, this could exclude some users who are unable to reach them. A suggested solution was to provide urinals that started at ground level. This would appear a more inclusive solution to this problem for male users of all heights. Trough urinals, which are set at an almost horizontal plane, could also be account for why some do not appear to drain as effectively as individual urinals.

6.3.4.6 Flushes

Urinals are commonly on an automatic flush cycle using a urinal siphon or similar mechanical devise they work on the principal that when the cistern is full, it triggers the flush automatically. This, in turn causes a continuous flush cycle regardless of whether the urinal has, or, has not been used, this cycle will continue unless the water is turned off or made unavailable. It also means that the users have no control on the flush. Participant M80 remembers as a boy and

a young man that an attendant would come in and flushed the urinals with water from a bucket.

Participant M60 said that in Slovenia, he had seen IR flushes used for the urinals. He described how when he moved away from the urinal, it would flush automatically. He liked the IR flush better than the urinal siphon as he said if he felt a urinal was going to start a flush cycle whilst he was using it, he would step back from the urinal. This behaviour pattern is a direct result of his concern that the flush may splash back and reach him. The idea of IR flushes was seen by some participants as a good solution, as they performed a cleaning operation after each use rather than on a continuous cycle, even when the urinal had not been used.

The concept of IR flushes on urinals appears to be 'new' to users in the UK. Although the users knew of the technology, they were not familiar with it in the setting of the urinals. Another type of flush mentioned was that of a continuous flowing flush. It was said that in Austria this type of flushing system has been found and that due to the presence of a continuous flush of water it reduced the smell of urine in the public convenience.

6.3.5 Sanitary waste units

The needs of female users of sanitary waste units in public conveniences were the focus for this section of the interview. In public conveniences, intended for use by women, there are often sanitary waste units available to dispose of sanitary towels, tampons and other menstrual waste. Commonly, one unit is provided in each cubicle and often it is located between toilet and the cubicle, or dividing wall, figure 6.16. However, many women do not require sanitary waste units in public conveniences because they are not menstruating.

Figure 6.16: Sanitary waste unit located between the dividing wall and toilet

In this section there were three themes (as presented in Section 3.6.3);

- Product use
- Emotional effect
- User requirements

These themes contained four questions for the participants to respond to. The findings were, sanitary waste units provided a solution to a potential problem of disposing of sanitary waste, however, the units are not desirable to use and can cause practical problems for users of toilets in female accessible public conveniences.

Men were not specifically asked about sanitary waste units in the predetermined question section of the interview. However, they were allowed the opportunity to give their views on sanitary waste units when presented with the artefacts. Most male participants did express views about them; they felt they provide a good solution for women when they need to dispose of sanitary waste.

Some male participants also expressed concerns about the positioning of it and how this might affect how they use the toilet as they might come into contact with the sanitary waste unit. Male participants attributed this to a lack of space between the unit and the toilet, due to cubicle size.

One of the requirements female and male users had of the sanitary waste unit was there to be a greater space between themselves and the unit. Space is often restricted in cubicles due to the placing of the sanitary waste unit down the side of the toilet. Having the unit there made the users feel negatively about using the sanitary waste units. It was also suggested that if the user of

the cubicle was a larger person, then there could also be space concerns due to the physical size of the user.

6.3.5.1   Alternative facilities

Prior to the sanitary waste units being provided, there were incinerators in the communal area of the public conveniences, figure 6.17. Although incinerators have not been in regular use (twenty-five years) some are still in use in public conveniences such as Sheep Street, Northampton and some women remember using them, or understand the principle of using them. The women agreed that felt that individual bins were better for the disposal of sanitary waste.

Figure 6.17: Sanitary waste incinerator

One reason female participants preferred the option of one sanitary waste unit per cubicle was because it was said to provide them, as users, with better privacy. However one female participant, F24 said that having a communal unit would be acceptable to her, and to use it she would wrap up her used sanitary waste in toilet paper prior to disposing it. However, if this participant was given a choice, she would prefer one sanitary waste unit per cubicle.

6.3.5.2   Privacy

Privacy of sight - Visual barriers are also important to users of sanitary waste units. Female participants generally agreed that they would want to have one sanitary waste unit per cubicle as opposed to a communal unit. Female

participants indicated strongly that they do not want to see other peoples waste and as such it is preferable to have bins with lids to bins without lids (F42), participant spoke of seeing other peoples waste and said that if they did it might make them choose a different cubicle. There was also a fear of encountering another person's sanitary waste in the flap when she came to use the unit (F42); this was something she has experienced when people have disposed of the waste on top of the sanitary waste unit, figure 6.18.

Figure 6.18: Overflowing sanitary waste unit

Privacy of smell - Besides the obvious physical obstacles of the units, in terms of space and usability, female participants' spoke of their concerns about the smell; it was described as 'off-putting'.

6.3.5.3   Material selection

Some female participants observed that the bins were always made out of plastic and in dark sombre colours such as grey and blue and this led them to being described as "clinical" (F24) which could be interpreted as meaning hygienic but not 'comforting'. Female participant, F31, said that the appearance of the units was "*anti-hygienic*" due to the plastic material.

There is no reason, other than a lack of design and product semantics, to make this product appear sombre or clinical and female participants questioned this.

6.3.5.4   Use

Female participants said during the interviews "*we've got to have them*" (F38) and that they prefer to have the units available, but that would prefer to use them without having to touch them.

Some of the users explained how they wrap their sanitary waste up in toilet paper prior to disposal. This user behaviour, along with toilet paper sometimes being used to open the sanitary waste units, indicates that there toilet paper is a tool for the users when interacting with sanitary waste units.

Hand (figure 6.19) - Not having to touch the sanitary waste unit is the main requirement the users were expressing. Users use toilet paper to lift the lid of the sanitary waste unit.

Pedal (figure 6.20) - Pedal units use a foot petal to open and shut the bin, there is also often the option to open the sanitary waste unit using the hand.

It was noted that it is difficult, if not impossible, sometimes to use the pedal operated bins whilst seated, this can be because sometimes the bins are put into the cubicles with the pedal facing the wall.

Several women indicated a preference for pedal operated bins, rather than hand operated bins and gave the reason as they were used to this system in their own homes.

Infrared (figure 6.21) - Adding IR sensors to the bins was seen by some people as a good option, however it would make a "*very cheap product very expensive*" (F31) and said that she would prefer the pedal operated bins. However, other users indicated they felt IR bins would be the better option as it would involve less touch contact.

It was also noted that if someone had a disability preventing them from using the sanitary waste unit with a touch contact opening, IR would provide a good solution to the problem.

Other issues (figure 6.22) – When designing a sanitary waste unit it is important to know what users want. As it can be understood from the toilet usage that some women do not sit and others do, the unit should also be accessible to users if they wanted to use it whilst they were seated on the toilet but also if they preferred to stand up and then dispose of their waste.

Figure 6.19: Hand operated sanitary waste unit

Figure 6.20: Pedal, foot, operated sanitary waste unit

Figure 6.21: IR Automatic sanitary waste unit

Figure 6.22: In wall sanitary waste unit

6.3.5.5 Requirements

Users were asked what their requirements of the sanitary waste units would be, it is possible, from the information gathered to say that they would like the sanitary waste unit to function correctly; the disposal flap would open and shut as intended with no blockages.

Another requirement was that the users feel there is a need for the sanitary waste unit to be regularly maintained so they are not presented with other people's sanitary waste. Other observations were that sanitary waste units were

sometimes overflowing; this could be attributed to people using them for disposing of nappies. This would not necessarily be such a problem if the disposal issues were correctly addressed the design stages. The sanitary waste units need to be designed so the waste will fall into the unity without obstruction and for it to be removed from sight. The sanitary waste units need to be maintained correctly and designed to reduce direct or indirect misuse.

When participants were asked what features they would like to have incorporated into the design one suggestion was to provide a way that "*does not allow things to get stuck so easily*" (F31), as well as, something to help contain the smell. The problem of disposing of the sanitary waste was attributed to the adhesive side of the pads and how this can at times stick to the flap of the sanitary waste unit if the pads are not wrapped up properly prior to disposal. If one user's pads have not been disposed of properly and become stuck to the flap, the next person not only has to see the waste stuck on the flap, but then has difficulty in disposing of their own waste as there is already a blockage, this then can cause further difficulties of future users. One solution suggested was that paper bags could be used to help with the disposal of the sanitary waste and in turn this could help stop the sticky side coming into contact with the flap of the sanitary waste unit.

6.3.5.6   Emotion effect

The main feelings towards using sanitary waste units were not positive and they were described as making the users feel dirty, and this feeling of being dirty was not overcome by washing hands. This feeling of '*dirt*' was shared by several participants. The sanitary waste units were described as 'nasty'.

6.3.5.7   Accessibility

Women commented about accessibility to toilets, they said that they were sometimes not afforded full access to them as there were other 'things' in the cubicles. These things were, amongst others, sanitary waste units. Female participants also said the sanitary waste units were sometimes too close to the toilet and therefore made them feel 'uncomfortable' when using the toilet.

The proximity of the sanitary waste unit to the toilet was also said to affect how the toilet is used. Female participant, F42, remarked that because the sanitary

waste units not fitting down the side of the toilet, allowing room for the users, they therefore take up seating room resulting in the user sitting at an angle. It was not just the thigh and hip breadth, which was said to be taken up by the sanitary waste unit, people also mentioned brushing their legs and arms against them. This in turn influenced the way the users interacted with the toilet.

Despite the space issues and the consequent change in user behaviour towards the toilet, the participants still want to have one sanitary waste unit in each cubicle. Within a cubicle they would want the sanitary waste unit to be within arm's reach, they also would prefer the unit not to be next to the toilet to allow space between themselves and the sanitary waste unit.

6.4 Conclusion

This research aimed to develop an in depth understanding about the specifics of the user-product relationships with public use sanitaryware products; toilets, urinals and sanitary waste units. The following conclusions can be made from this study. It was now possible to clearly define different stages in product use and establish that these phases, at time were dependent upon the products and their layout and this was a contributing factor to the user-product behaviour.

Users also described their product use; men spoke of urination and defecation where as women spoke of these the tasks but also menstruation. From the interviews it was possible to establish that the two elimination tasks for men and three for women were not independent of each other. These elimination tasks were often dependent upon the products available and the emotional reaction the users had towards them. Participants also spoke about the context of the environment in which the products were set and how this was also a contributing factor to their use. Therefore, it is now possible to see that for men three different themes were important to consider when designing and for women four different themes were important;

Men; environment, defecation and urination
Women; environment, defecation, urination and menstruation

As such, it was now possible to conclude that these different themes must be presented to designers so that they are able to consider the user's needs in relation to other aspects. It was also evident from the interviews that there were areas that were specifically 'male' and others 'female' as such, these

needed to be presented independently. The aspects that were similar, such as urination and defecation using a toilet, and these should be presented in a similar manner but without the need for repetition of information.

Within each of the elimination tasks four themes were identified these were; purpose, task, hygiene and privacy. These are the main important aspects of user-product interaction that needed to be presented to the designers to aid them when designing products for public use sanitaryware. However, the environment was also of great importance. Interestingly the environment was seen by the users a being of a 'broader' subject area than that of the 'built environment' and encompassed many emotional reactions to the less tangible aspects of the environment such as safety and crime. These issues along with the product use issues are essential to understand and to present to the designers for the next stage of the project, the product design guidelines.

CHAPTER 7: BEST PRACTICE GUIDELINES

In this chapter, the findings of the research to date were compiled into a 'best practice guide' for product designers of public convenience sanitaryware products. This resulted in a pamphlet being created; subsequently this was tested and evaluated for its effectiveness and appropriateness with practising product designers and industrial design students.

When researching user-product relationships, with the aim of the project to be guidelines to aid designers, it is necessary to engage designers to participate in using the tools designed for them to achieve this, designers were invited to participate (see Section 3.10.2). The researchers' background is in design so there was already an established understanding of this; the pamphlet was designed for, and piloted with product designers. The emphasis of the guidelines was on the end user of the products; real people, as such the guidelines had to reflect this and emphasise real user needs and setting the design project in a realistic environment.

The pamphlet was designed to reflect the needs of the users, the environment in which the users interact with the products and the user trends. This information was presented to the designers for them to use and design with. Following the design exercise, designers were asked to participate in a short interview (see Section 3.10.3). The results from the design exercise and interview showed that generally, the designers did use the pamphlet when designing and it was said, that the information in the pamphlet had an impact on their designs. This was due to them learning new information, thinking about the user's needs and how they were different and similar to their own needs and by presenting the information in an accessible manner. This led there to being similar responses from the designers across the study.

7.1 Creating the pamphlet

The information presented in the pamphlet had to explain the user's needs to the designer. To facilitate this, several explanations outlining the reason for the pamphlet and the needs of the users were provided for the designers. Language was also considered, it was intended that the pamphlet would not bias the designer, the aim of this was to see if, by not using product specific words; **'toilet'**, **'urinal'** and **'bin'**, the designers would feel there was more freedom in

the brief set, where possible these words were avoided. On the page titled "*encourage use, reduce misuse*" these product specific words were used as the information presented related to previous research and would have been ambiguous had these words not been used. It was also felt, for similar reasons, that 'toilet paper' would not be mentioned. This is because toilet paper and the dispensers were not the focus for this project. It is clear from the previous research that for toilet users in the UK, cleaning after elimination is a normal procedure. Instead of focusing on toilet paper, an emphasis was put on hygiene and the users need for hygiene.

A diagram of the user's decision and use process was included, figure 7.1. This diagram was intended to provide designers with a basic insight of the users' decision process when using public conveniences. It was hoped this information would be used to develop the designers understanding of the users, thus enhancing the design, overall usability, and enjoyment of the product.

product use process
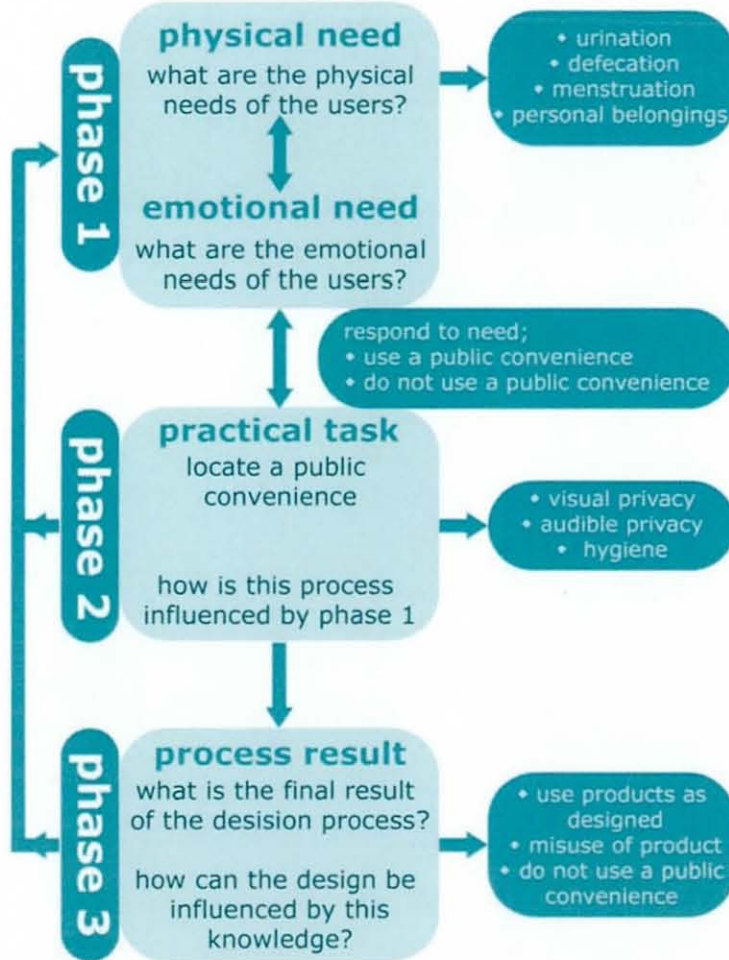
Figure 7.1: Product use process

Phase one: need - In this phase the user must establish if the need; urination, defecation, menstruation, warrants them to be accompanied by their personal belongings and/or the other people with them etc... to move onto to Phase two, or not and stay in Phase one.

Phase two: practical task - This is deemed a 'practical task'; here the user must interact with the public convenience sanitaryware products. This interaction may not necessarily be a physical, the research has proved many of the interactions users have with the products are influenced by emotional responses to the environment in which the products are placed and the products themselves.

Phase three: decision and knowledge - When entering Phase three of the decision process the interactions of the users relates to how they choose to use

the products; this can be as intended, or not as intended. This phase of the product use process can result in returning to Phase one.

Once the users have progressed through the product use process, they either do, or do not use the product. For this research three elimination tasks have been investigated and there is usually, depending on the facilities provided, a decision made by the user as to the product being used depending on the task which is normally dictated by the physical need and gender; urination and/or defecation (figure 7.2 and figure 7.3), and/or menstruation (figure 7.4). These elimination tasks were presented in the "mix and match" section of the pamphlet.

elimination of all body waste; defecation and urination

consider the users needs
- accessibility to receptacle
- sanitary removal of human waste
- physical need driven use
- provide basic uncomplicated solution
- task; elimination, menstruation needs

purpose

task

users physical interaction
- product use altered by personal belongings
- reduce touch contact
- effectivly remove elimination
- increase product use, reduce misuse
- **women:** children influence product use

product use & upkeep
- increase product hygiene
- reduce primary & secondary contact
- avoid liquids in contact areas
- design for easy cleaning & repair
- provide provisions for personal cleansing
- allow users to clean the product

hygiene

privacy

user preference
- increase visual, audable & odour privacy
- variation in physical position
- reduce reminders of other users
- privacy from others and for users
- allow for personal use preferences

Figure 7.2: Elimination of all body waste; defecation and urination

elimination of body waste: male urination

consider the users needs
- allow users a choice of products
- accessibility to receptacle
- sanitary removal of human waste
- task: elimination of urine

purpose

task

users physical interaction
- increase product use, reduce misuse
- effectively remove elimination
- allow space between users
- allow for interaction with users of all heights

product use & upkeep
- reduce touch & transfer contact
- design to avoid salt deposit build-up
- design for easy cleaning
- flushing & its affect on product use
- avoid splash transfer from other users

hygiene

privacy

user preference
- increase visual privacy to conceal genitalia
- audable privacy
- reduce reminders of other users
- privacy from others and for users
- individual receptacles

Figure 7.3: Elimination of body waste: male urination

removal of waste: menstruation

consider the users needs	users physical interaction
• sanitary removal of menstural waste • accessibility to receptacle • task: disposal of menstrual waste • provide basic uncomplicated solution	• increase product use, reduce misuse • reduce touch contact • design for easy disposal • reduce blockages in receptacle

purpose   **task**

product use & upkeep	user preference
• increase product hygiene • reduce touch contact • provide adequate space for users • design for easy use	• provide one unit for each individual location • remove reminders of other users • reduce smell from other waste • offer an alternative to hand interaction

hygiene   **privacy**

Figure 7.4: Removal of waste: menstruation

The three elimination tasks - From the information gathered in the interviews there was what appeared to be one task that was more frequently occurring when using a public convenience than any other, this was to eliminate urine; the next most 'common' task was that of defecation. These two tasks were common to men and women, figure 7.2; however, men and women described their user behaviour as different. From this, it was clear that men tend to have a clear distinction between a visit to a public convenience for urination only (figure 7.3) and that for urination and defecation (figure 7.2). Whereas women tended to talk about urination and defecation together (figure 7.2), this is possibly due to women being provided with only one product, where as men have the choice between a urinal and a toilet for urination. The last task was specific to women, although not all women are menstruating at the same time, nor are all women of menstruation age, they all tend to interact with the sanitary waste units (figure 7.4), this then became the third task.

From the previous study four areas had been identified as key focal points for users, these were similar irrespective of the task. They were; purpose, task, hygiene and privacy. Although it could be argued that some of these focus points could be subdivided and some overlapped it was felt that the presentation of the information in this layout would best convey the findings as well as communicate the intentions of the research to the designers.

Purpose; consider the user's needs - for this focus point, the needs of the users were explored. These were sometimes general statements such as, accessibility to the receptacle and the need driven use.

Task; users' physical interaction - for this focus point, the emphasis was on the physical interaction the users had with the products.

Hygiene; product use and hygiene - hygiene and maintenance were presented in this point. It was found that although maintenance can be viewed, as a separate issue concerning repair to damage this was not generally what concerned many of the users it was more the day-to-day running and upkeep of the products.

Privacy; user preference - this point had the most differences between the three elimination tasks. This was primarily due to the location of the existing products. People who use toilets often find them in cubicles, men who use urinals often find them in communal areas, and women who have menstruation waste to dispose of often find bins in each cubicle. It was for these reasons the there were differences. Urination and defecation was seen as a point that could be presented for both genders together.

Environment - in addition to the three elimination tasks is the building in which the products are set. Each elimination task was presented so that it was able to be viewed in relation to the environment in which it was found; availability (figure 7.5), mind set (figure 7.6) and user safety (figure 7.7). All of these environments are dictated by the physical surroundings of the users. These environments are not necessarily tangible nor are they the same for every user. The environments are very often emotional responses to the user's needs in conjunction to the physical surroundings, thus creating an environment. This section was hoped to provide a clearer environmental view of how the user finds him or herself in it thus creating a clearer environmental setting for the designer to work with.

environment

availability

encourage availability through design
reduce waiting times
number of facilities and the correct types of facilities
use effective communication to aid users

Figure 7.5: Environment, availability

environment

mind set

influences on the user's frame of mind;
physical need, phyical ability, religion, family &
privacy issues

Figure 7.6: Environment, mind set

Figure 7.7: Environment, user safety

Availability - this was aimed at encouraging designers to think about the wider availability needs of the users. Availability could be viewed as an accessibility issue. However, availability is more than just accessing the facilities but making sure the design of the product was correct to the task and encouraged use.

Mindset - this was aimed at encouraging designers to think about the how the user will feel when they are using the products. It was found through the previous study that the users needed to feel that they had a comfortable and accessible environment, not just physically but emotionally. It was determined that the users *"mind set"* could in some instances override the physical needs of the users. It is essential that when there is a need from the body to use a toileting facility that the user is not faced with a mental obstacle.

User Safety - user safety was not just limited to the threat or act of physical violence to the users' person, but was also concerned about the personal items that the users had with them. None of the participants had experienced violence to their person but some had concerns about this, whereas more were concerned about their belongings. This issue seemed of particular importance to both genders but for different reasons. Female participants were more concerned about their personal belongings being stolen when they were using a toilet in a cubicle, however, men were not just concerned about this but about the potential for physical attack from others users. This is because men use urinals and are generally facing a wall when doing so however, sometimes urinals are placed on lower walls which men can see over.

The working environment of a public convenience is essential to consider and comprehend when a product is to be place within it. As previously mentioned the products provided for public conveniences use; which is used by anyone, is often the same as the products found in other more intimate home settings as well as more exclusive settings such as offices, pay to enter sports venues.

7.2 Designer study

As with all the previous research a mixed-method was employed. This mixed-method had two main stages; the design exercise and the interview.

The sketch sheets were examined to investigate the way in which participant had undertaken their designing, for example, was there reference to the pamphlet and the information it contained. Participants were asked if it would be possible to contact them again should there be any further questions arising following an in-depth look into the sketch sheets. A copy of the survey questions can be found in Appendix 11.

7.2.1 Pilot study

A pilot study was conducted with two product designers studying for PhD degrees in the Department of Design and Technology, Loughborough University. These participants were chosen because of their background in industrial product design, design research and because they were already familiar with the research. The familiarity with the research may have potentially produced a biased result, should they have taken part in the main study. Their selection was also critical as they were trusted to be unbiased and objective to the testing of the research methodology. Although they were familiar with the project, they were not informed, prior to the pilot study, of its contents or what it involved in any greater detail than the designers who were approached to participant in the main study.

The two designers for the pilot study were informed that the trial would be a design exercise, they were told it would last about one week and in that week they were asked to spend as much time as they could afford designing, although three hours was the envisaged adequate time on the project. They were also informed that they would then be interviewed after the design project to answer questions in relation to it. Samples of the work produced by the pilot study participants can be seen in figure 7.8.
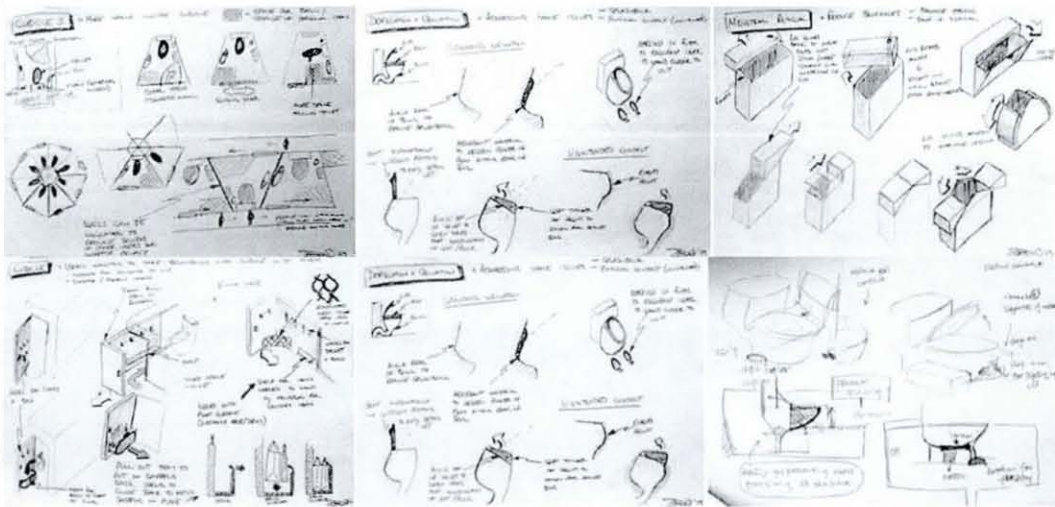
Figure 7.8: Sample sketch sheets from the pilot study participants

Both participants were met individually, presented with a guidebook (pull out booklet inside of last page), informed of the design exercise, and given the design brief verbally, because this was done in person, there was opportunity to ask any immediate questions they had concerning the design exercise.

In this part of the pilot study, it became clear that this would be better presented in a letter as the pilot study designer made notes of what was said. The information given by the researcher was then transcribed into a letter, this letter was read out aloud in the main study, this ensured that all participants were given the same information and that it was presented in the same way. This change was discussed with the pilot study designers and viewed as a major improvement by them. Although this method did not give any 'extra information', it did clearly state what the intention of the design project was. It was predicted by the researcher and pilot study designers that this letter would answer some of the immediate questions the participants would have had, namely, "*could the information be repeated?*" and "*how long do we have to do the designs?*". The transcript of the body of letter is given in Appendix 12.

The letter was then, in the design exercise, handed to the participants along with the informed consent form. It was at this point that participants could have, if they wished, asked the investigator questions concerning the research project. Most of the questions were in relation to if the work was being "*marked*" in a way similar to coursework or they were in relation to the '*level of work*' that needed achieving; presentation boards, CAD renderings etc... The response to these questions was similar in all cases;

- work would not be marked but would be looked at to help the researcher gather an idea as to the design outcomes

- the level of work they produced should be appropriate to the task
- work as if this was a brief in industry with a few hours to start the project

Both of the designers for the pilot study also participated in a follow up interview. This interview highlighted that the order and the wording of the questions in the interview needed changing for the follow up interview in the main design study. The options were discussed with the pilot study participants following their interviews.

The other encouraging finding from the pilot study was in the methodology both of the pilot study designers expressed enthusiasm and delight from taking part. This finding was encouraging as it gave promise of a complete main study, as well as, proving that the pamphlet was enjoyable to use in the context of the design exercise.

7.2.2 Design practice study

The main design practice study was conducted over two months, February – March 2009, during this time ten designers undertook the project. Initially it was anticipated that fourteen designers would participate in this part of the study but due to reasons beyond the control of the researcher and the participants, not all designers participated as hoped by both sides.

7.2.2.1   Twyford Bathrooms' designers

Four designers from Twyford Bathrooms expressed an interest in participating in this study. Unfortunately they felt they were unable to participate in the design project at the present time but have since been debriefed by the investigator and have expressed the intention to use the guides as described when they commence their 'Public' project, which is due to start in Autumn 2009. However, although the designers at Twyford Bathrooms were unable to participate fully in the design project they did provide a response to the product and this will be discussed before the results of the 10 designers who were able to participate fully.

Twyford Bathrooms - Simon Hopps, a designer from Twyford Bathrooms was debriefed over the telephone on 18th March 2009. Simon Hopps is the head of Project Management and Industrial Design as well as the Project Manager for

Europe. Simon was able to give an insight into the ceramic sanitaryware industries response to the pamphlet.

The pamphlet was described by Simon Hopps, who was relaying feedback from his design team, as "*clear*" and said that it "*highlighted the issues we need to consider*" as designers for public use sanitaryware. The pamphlet was said to be useful in "*facilitating a thought process and brainstorming*". The pamphlet was seen by the designers at Twyford Bathrooms as a starting point for the design as it was said to present the "*unique challenges faced for public use products and provide a significant start that can be built on*".

When asked their reaction to the pamphlet before they would start designing it was described as "*very useful*" this was because it was said to "*remove the need to do the research*". Although the pamphlet has not been fully tested by the designers at Twyford Bathrooms, their feedback was seen as a substantial and significant positive reaction to the pamphlet leading to the desired result from the researcher. The pamphlet was not intended to remove the need for all research, as the thesis findings would have presented the 'ideal product' rather than presenting an investigation into the creation of a design tool for product designers; guidelines. The designers at Twyford Bathrooms had described exactly how the pamphlet had been intended to be used; as a tool for aiding and guiding designers not dictating design outcomes.

The designers at Twyford Bathrooms said the layout of the information was initially confusing; this was attributed to the "mix and match" section. However, this section was later appreciated once they had familiarised themselves with the pamphlet. Unfortunately, when the pamphlets and covering letters were sent to Twyford Bathrooms, the investigator was unable to hold a person-to-person conversation with the whole team but had an initial conversation with a different team member to Simon Hopps. This conversation would have answered many of these initial issues such as; the issue they had with the "mix and match". However, the designers were able to use their intuition to resolve the use issue of how to use the "mix and match" and concluded that the presentation of the information in this format "*reduces repetition and gets the information across*", this was said by Simon Hopps to be "*unusual, but good*" way of presenting information. If the information was predictable and repetitive he felt that it would not have engaged with the designers. However, this method of presenting the information in the "mix and match" was designed to have this "*unusual*" effect in order to add a level of interest to the product.

When asked if they would use this type of guide to design products for this market Simon Hopps said they would, he then continued by saying that they would keep the pamphlet and employ it for the upcoming "Public" project as it gives them a "considerable step forward" for this particular project. Simon Hopps also said, "*it [the pamphlet] gives an insight to the user's problems and not those of the architects*". He said, "*manufacturers do not concentrate on the user's needs and many products are similar for different locations*" (referring to public and private sector). This guideline was different as it was specific to public conveniences not in the private sector.

Simon Hopps spoke of the consumer benefits of the pamphlet, and said that they can only be implemented in two main ways;

- **legislative change**; this is time consuming and would not show any immediate effects until it was made law to adhere to new legislation
- **voluntary change;** this can be achieved by giving companies a competitive edge that could have a monetary return

It is this second option that has been a focus for the designers at Twyford Bathrooms. If changes are made voluntarily by companies, they are possibly more enthusiastically acted upon. Branding and brand image are important to establish, maintain and exploit, especially at present with the economic downturn. Many of the items manufactured by Twyford Bathrooms and their competitors are designed to provide solutions at minimal cost. This solution is, for the urinals and toilets, the removal of human waste. However, there is a base line for production costs that cannot be reduced and once all companies are working to the baseline there needs to be innovation to encourage people to spend money for a solution that provides a better service. Twyford Bathrooms is actively looking to add value to their product rather than "*just cut the price*", they described their aim as "*to invest in product development that can provide leverage over our competitors*".

Twyford Bathrooms were unable to take part partly due to other commitments but also want to exploit the guide in a live project to "*do it justice*". Twyford's have kindly agreed to take part in a later study, which will analyse the use of the guidelines in detail and will hopefully qualify the findings from the other ten designers.

7.2.2.2   Industrial product designers

The results of the design project from the ten designers were, in general, positive. The response to the design project was enthusiastic from most of the participants. As such, this has meant that the findings of the study can be deemed as positive. However, there were some areas that are able to be improved upon to create a more successful user guide.

Clarity - when discussing the design brief, reading out the letter to the participants, there was on several occasions some confusion apparent from the participants as to what needed to be designed. Four of the designers did not design sanitary waste disposal facilities. Reasons designers gave for not completing the task were, from designer 005, *"I'm a man, what do I know about women's needs"*, designer 006 said, *"I did not fancy tackling that as I'm a man"*; designer 009 said he did not feel he knew enough because he was a man. This small, yet significant, finding highlights this disposal issue of menstruation was not addressed was because the male designers felt they could not sufficiently empathise with women's needs. Designer 007, although she participated in the study, she did not complete fully participate in all of the tasks; the design exercise and questionnaire.

Engaging with designers - as the pamphlet was intended to engage with designers, to encourage them to design solutions for the needs of the users, it was important to firstly action this engagement with them visually. In general, the designers agreed that the pamphlet achieved this objective as it only received only a few negative comments. These were mainly based around the colour choice, and punctuation of the text.

The designers were asked to describe how the pamphlet looked to them. This question was aimed to elicit only the information about the visual impact of the pamphlet.

Appearance - the appearance of the pamphlet was discussed by the designers. The colours chosen for the pamphlet were liked by the majority of the designers. Nine of the ten designers said that they liked the colours; this included the colour blind designer, designer 006. One designer commented that the three-tone printing was beneficial for environmental reasons. Designer 008 said that the darker tones highlighted to her that there was more importance on that word/phrase and lighter indicating less importance. However, this view was not shared by all of the designers, designer 007 said that she, did not like the colours because the shading used prevented words being clearly highlighted

depending upon their importance, and designer 004 said that she would employ the use different colours, for each of the elimination tasks, in order to highlight that they are different. Designer 006 is red/green colour blind and because of this, he said that he did not like the colours because they make it difficult to see the information on the page, although in another question he said he did like the colours. He said he would have benefitted from having different colours, outside the red/green colour range, rather than different tones of the same colour.

Other recommended changes from designers 002 and 007 were to include more punctuation. This was to increase the clarity of the phrases and sentences. Designers 004 and 005 said that they would also add page numbers.

However, the consensus towards the appearance of the pamphlet was positive. It was described as "*professional*" in appearance, as well as, "*contemporary*". The pamphlets layout was described as "*uniform*" and this was said to help when working through the information within it was well categorised.

The inclusion of the graphics on the front cover, the postures of users and the flow diagrams were also said to engage with the designers as they were "*more interesting than text*".

Content - following the initial visual engagement of the designers with the pamphlet it was necessary to establish if they then used it. All the participants, with the exception of designer 006, participated in the study as they had been asked to; this was "*to use the pamphlet as they saw fit to complete the design exercise*".

Designer 006 explained that he decided to "*test the theory of the methodology*" of this design exercise, his reasons for this were that he thought that it might provide the researcher with an interesting result. Following this decision to not design as if he were conducting this as a live project, designer 006 made his initial designs without using the guide. He described how after designing his initial concepts he later adjusted the designs and re-designed some features using the pamphlet as a guide and, through doing this, he felt that the guide helped him greatly.

The remaining nine designers spoke about the information within the pamphlet and said that they felt able to trust the information. Some of the designers felt that they had no need to conduct further research such as designer 002 who said that she lacked the necessary skills, as a designer to perform this type of research. This finding is positive in as much as it proved that the designers felt

they could trust the information but this could also appear as a false positive. The designers were provided, on the back cover, further reading information, as well as, contact details of the researcher. Only one, designer 010, looked into the further reading available. Designers 003 and 010 conducted further research by using the internet and sourced information from external sources not supplied by the researcher. Designer 006 said that if she had the opportunity of more time she would also have done further research. This in itself was encouraging as the designers were provided with guidance that aided them to look for other relevant information to fulfil the design brief. Several designers also contacted the researcher, but this was for clarity on the design exercise and was not to gather more detail about the users but was to ascertain "*how many design pages*" were needed for the design project.

It was also important to provide not just a visually engaging pamphlet, but also one that would inspire the designers to think and create. The information in the pamphlet was described, as "*the right amount*" by designers 001 and 002. Designers 004 and 008 said that the information was in places, namely the "mix and match", as too much and this could make it difficult to find a focus. Designer 004 has experience of designing sanitaryware and later said that she felt, on reflection, the pamphlet provided a good source of information for her and that designers new to the subject area would find it useful.

Using the pamphlet - there was no prescribed method for the designers to use the pamphlet, they were invited to participate in the design study and were asked to use the pamphlet as though they had been asked to undertake a 'live' project. Nine out of the ten designers, with the exception of designer 006 who read the first two pages only, read the pamphlet before starting their design project. Each designer then used the pamphlet in accordance to how they worked on the project. Designers 003, 004 and 005 said they felt the pamphlet provided them with direction for their designs and used the pamphlet to do this. Designer 003 said that he found pages one to four particularly useful for this. Designers 002 and 009 said that they found the images of users and their elimination positions useful in guiding their designs and used these images to create a focus when designing.

The pamphlet was used by the designers either before or during the design phase; most participants coupled this with refereeing back to the pamphlet at the end of the design exercise to 'check' they had covered all the relevant points.

Statistics - included in the pamphlet there was a page titled, "encourage use, reduce misuse" see figure 7.9. This page contained some statistical information from a survey conducted previously in this study. This page was used by several of the designers as a focus for their designs and which areas of the designs they wanted to address. Designer 003 said that they used this page from the pamphlet the most when participating in the design exercise. Designer 002 described the information on this page as "*inspirational*" and expressed how this page greatly influenced her decisions during the design process. Designer 005 also said that the information helped him identify the user's needs but continued to say that he would have preferred the information to be presented in the order of its weighting i.e. the percentage of the statistic, the higher the statistic the nearer the top of the list it would be. The information was purposefully not presented in this way for several reasons. Where two statistics were presented, in the same information point, this would have caused confusion. It also made sense to group the statistics from a product use perspective; splash back affects the users perceived level of hygiene from the products that in turn affects their use, and this can then have an effect on the efficiency of the use and so on.

encourage use, reduce misuse

reduce misuse by designing products that are intuative to use, easy to maintain & answer the users needs

consider material selection; easy clean surfaces

design for repair; these are high volume multi-user products

remember current product use trends

toilets:
• splash back concerns 66% of users of toilets
• 14% of male & 57% of female users crouch over toilets due to hygiene concerns
• 60% of female users find it difficult to crouch over a toilet
• 45% of males who urinate into a toilet from an upright position have difficulty aiming

urinals:
• 33% of males find it hard not to get splash back
• 25% of males prefer to use toilets for urination
• 95% of males find urinals easy to use

sanitary waste disposal units:
• 32% of females are inconvenienced by the unit when using the toilet
• 52% of females say units are unpleasant to use

Figure 7.9: Encourage use, reduce misuse

Images - the pamphlet was designed to provide the designers with information about the users who would be using the products. It was important to provide this information in an accessible format. Some of the designers, 002, 005, 006, 007 and 009 specifically expressed that they would have like to have been provided with more images, this was the original intention. However, it was not possible to add in as many images as initially envisaged as this had the potential to bias the designers. Images of products and environments were removed for these reasons. However, designer 009 realised that had more images, specifically of products, been included it would have led to a bias.

The images that were included were on the front cover see figure 7.10, and on the page titled, *"know your users abilities"* see figure 7.11.

Figure 7.10: Cover image

Figure 7.11: Image within the pamphlet

The image on the cover was designed to engage with the designers to provoke thought and to encourage them to think about 'real people as users' and not a distant idea of an 'end users'. The research has been focused on facilities that were not specifically 'accessible' facilities but for the 'able-bodied user' the image was intended to show that within a group of nine people, as shown on the cover, there are obvious differences between people.

The main obvious differences are;

- men and women are shown, this was to encourage designers to identify with the opposite gender to them
- people of different heights and within each gender and body sizes'

- people wearing different types of clothing from short sleeved t-shirts to overcoats and scarves, casual wear to smart clothing as well as the participants all wearing shoes of varying styles
- some of the people are carrying extra items such as shopping bags, rucksacks and one woman is pictured with a shopping trolley
- people of different ages

Although this message might have been subtle, as this image was not explained in depth in the pamphlet, it was hoped that this image would work as a way of engaging with the designers to think about real people. It is uncertain what effect this image had, however the designers did say that the image was engaging and that some felt that looking at the cover encouraged them to use the pamphlet and they found the images useful in the design process.

The other main image in the pamphlet is the one shown in figure 7.11. This image showed the five main ways the interview participants had described positioning their body's when using a toilet and or urinal. The middle two images are of the same position, one from the side and one from the front.

Designers 002 and 009 said that this image was influential on their designs as they were able to see how users positioned their bodies and how this was different to their, the designer's, personal approach to using the facilities see figure 7.12.

Figure 7.12: Thinking about users in the design process (Designer 002)
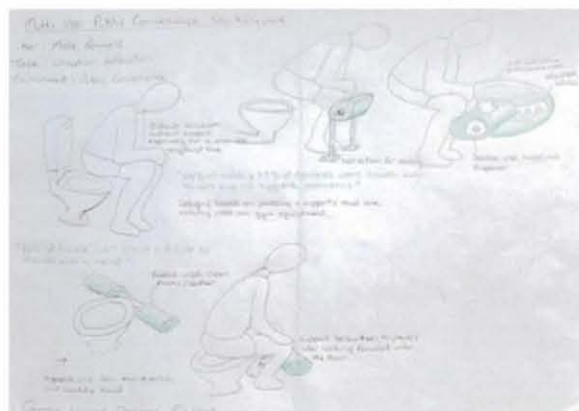
Designer 004 said that it was the entirety of the pamphlet and the way it was laid out that helped this. The pamphlet was designed to be visually stimulating without distracting. Each page used a manipulation of the three-tone green with the white of the paper to create highlights for the 'more important' text as well as create uniformity within the pamphlet.

Mix and match - in order to engage the designer the pamphlet was designed to be 'interactive'; this involved the designer turning the pages and matching up different 'tasks' to 'environments', which has been termed *"mix and match"*. This not only engaged the designer with the pamphlet but also maximised the effectiveness of the information without the need for repetition. It also allowed the information to be clearly presented thus maximising the use of space.

The "mix and match" section was a focal point for part of the interview. It made up almost half of the main section of the pamphlet and as such, and due to the method of displaying the information, it was decided to ask the participants specifically about this section. It was in the "mix and match" that the three elimination tasks were presented, as well as, the environmental settings and concerns of the users.

The "mix and match" was designed to avoid repetition, of results from previous research. It was possible to ascertain that certain concerns, such as the environment and settings in which the users interacted with the product were similar to both genders and for all three elimination tasks. It was felt this information did not require repetition. This meant that the top third pages in the "mix and match" were separated from the bottom two thirds. This allowed the pages to be "mixed and matched" depending on the elimination task and the environment that was affecting it.

This splitting of the pages did not mean that the designers had to use this part of the pamphlet this way. Some of the designers read each section independently and subsequently joined the information through a design, others used the section by flipping the pages to get different scenarios. Designer 009, who *"flipped the pages"* described the "mix and match" section as *"an intelligent use of paper"*. Designer 005 described using the "mix and match" by flicking the pages and being able to put the top and bottom sections together to 'explore' the users issues when dealing with each elimination task. Designers 003 and 008 said that they were able to, with each subsequent read, gather new information from the "mix and match".

Designers 001, 003, 004 and 008 all said it was useful in the design process to have the information that was present in the "mix and match" and designer 002 said that she found the information useful, but did not refer back to it when designing. Designers 001, 008 and 009 found that the bottom half of the "mix and match" was particularly useful for their designs and they referred to this

part more than the top part. Designer 009 said he felt the "mix and match" enabled him to keep a focus on the point of interest he had identified.

Designers 001 and 003 commented on changes they wanted, 001 did not enjoy having the split in the pages and 003 was not sure how to better the layout but would like to change it. Designer 006, who did not use the pamphlet as instructed, said that he felt there should have been pictures in the "mix and match".

7.2.2.3   Appropriateness

The appropriateness of the pamphlet was able to be measured on several levels. In general, it is possible to say it was successful as the designers completed the design exercise. It is not possible to say how successful their designs are as they are not completed (figure 7.13) and there is no budget available to prototype any of the designs. However, several themes did occur and these are directly related to the users input and the information, which was presented in the pamphlets. This was very encouraging result, as this objective had been met.
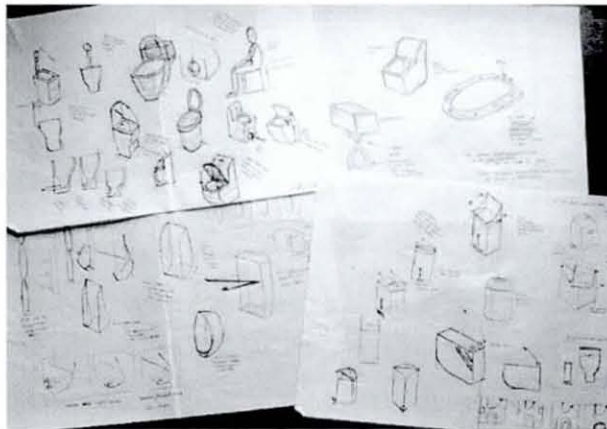
Figure 7.13: Sample sketch sheets (Designer 003)

However, true success will only be achieved if these changes are implemented. To achieve this it is important to know if this pamphlet would be used again. All the participants said they would use a pamphlet like this again, for this type of design work. Designers 009 and 010 said that they felt in industry there is not usually time to do this type of research and designer 002 said that she felt she lacked the skills, as a designer, to do this type of data collection due to the nature of the subject and the time it would take. For these reasons, they would use the pamphlet again. Designers 003, 004 and 007 said the pamphlet

highlighted that the importance of the actual user needs were and how this relates to the environment and the product use. Encouragingly designer 008 said, "*more information can still be taken from it*". These results indicate that there is more information that can be taken from the pamphlet and that the pamphlet proved useful to the designers for future use.

This would indicate that the information in the pamphlet was presented in a way that engaged with the designers and thus encouraged them to want to use it again.

Education - To be successful, the guide, as previously mentioned needed to engage with the users. The pamphlet needed to make the designers aware of the needs of the users; it needed to educate them. Six of the participants mentioned specific instances where they felt they had learnt something new from the pamphlet. Two of the designers, designers 003 and 010, said they came to the design project with no prior experience of the subject area but felt they had learnt "*something new*" through using the pamphlet.

Designers 003 and 008 both commented on how they learnt about the user interactions with the products and tasks. Designers 001 and 003 said that they were able, through the "mix and match" section to see insights into the subject, as well as, the user needs. Designer 008 said that the information he was provided also allowed him to design without the need for him to conduct his own research into menstruation. Designer 008 said she was able to "*learn about and identify*" the importance of some of the users issues which she would not have previously been aware of, she also learnt that some of the issues that concerned her were applicable to other people than herself.

Learning about the opposite gender also was a point of education. Male designers 005 and 009 said they learnt about women, specifically in reference to menstruation and the pamphlet highlighted the areas of interest that helped them understand the needs of others especially women. Designer 005 and 009 attributed this lack of knowledge to the "*gender barrier*". Unfortunately designer 005 decided to not design for this elimination task as he felt it was not "*his place as a man*" to design this type of product for a woman. Female designer 008 also spoke of how she learnt about issues that related specifically to men and this provoked debate amongst her colleagues.

Some of the designers, specifically designers 008 and 010 described how the pamphlet encouraged them to think about other cultures to their own. Designer 006 and 010 spoke of their travel experiences and how this helped, but also

how the information in the pamphlet led them to consider these cultural differences.

Usefulness - The designers were also asked to reflect upon the 'designing experience' once it had been completed. All the designers said that they felt the pamphlet had a positive influence on their designs, and that they felt the pamphlet had an influence on their final design outcomes. Despite all the designers saying this, four of the designers indicated that they would have come to the same design conclusions without the pamphlet as an aid.

Designer 001 said that he was already aware of some of the issues from his personal experiences, but he also said he learnt new information about the subject, specifically from the lower sections of the "mix and match" and about hygiene. Designer 003 undertook additional online research to complete the design project, he said that the "mix and match" was useful in the design process because he did not know much about the subject area. Designer 003 said he felt it *"gave me an insight into the different user reactions"* to the elimination tasks and as such he was able to *"put that into a design"*. Therefore, it is unclear why there is ambiguity in these results. Designer 004 has experience of sanitaryware design therefore, it is possible that due to the nature of the design exercise only lasting a few hours over seven days, she did not have enough time to continue exploring the subject area. She commented that the pamphlet gave her the constraints of a live brief and that as such she refrained from *"blue sky"* designing. She said the pamphlet provided her with a focus. Designer 007 said that she felt the pamphlet provided her with points to consider which she would have otherwise not thought about. She commented that her designs were based on her experiences and that should she have had more time, it might possibly have resulted in more developed design concepts and outcomes.

The designers were also asked if they had enjoyed using the pamphlet. Seven of the ten designers said they did. It is important to remember that designer 006 decided to 'test the methodology' of the pamphlet and as such it is not possible to determine the accuracy of the result he gave. However, this is an encouraging result and future work would look to implement some of the changes suggested by the designers to better the pamphlet.

Designer 009 said, in relation to his thoughts of the pamphlet when he had completed the exercise as it had *"provided a good experience"*.

7.3 Conclusion

This study was the culmination of all the previous research and was presented to designers in a 'best practice guide'. The pamphlet was tested with ten designers, as well as, four sanitaryware designers who were unfortunately unable to participate fully. It is all of the responses' from the designers to the pamphlet that have formed the discussion in this chapter.

The designers were presented with a brief and the pamphlet. For all 10 designers it led to design development although, in some cases, it would have been preferable to provide the designers with a longer period of time.

As the pamphlet was intended to engage with designers, to encourage them to design solutions for the needs of the users it was important to firstly action this engagement with them visually. In general, the pamphlet was agreed to achieve this objective and received only a few negative comments, which were mainly concerned with the colour choice and punctuation. The pamphlet engaged with the designers and provoked design exploration, this is evident through their designs, as well as their response to the follow up questionnaire. Only designer 006, who decided to 'test the methodology' did not engage with the pamphlet as requested. However, he returned to the pamphlet at the later stages of the design process.

The designers showed that they thought about the participants in their designers as they commented that they 'learnt new knowledge'. This was particularly interesting as both male and female designers commented on how they learnt about the needs of the other gender. The designers through their designs demonstrated that they thought about product use, as well as the users abilities. This was said to have been helped by the information presented in the pamphlet. This influence from the pamphlet was seen through the designers using the statistical evidence, the image of the users in various elimination positions as well as the "mix and match". Designers also said they were able to combine different environments with different user tasks by combining information from the top section of the "mix and match" with the bottom section, as well as combining information from the pamphlet as a whole.

If this study was to be repeated funding would be sought to print the pamphlet on better quality paper or thin card as well as have a better finish to avoid errors in the printing by using the printer employed to make the pamphlets that were used in this study. Designers would also be provided with a two-week

window as a minimum for completing the study to allow the designers who felt there was not enough time, more time to complete the study to a level they felt was appropriate.

CHAPTER 8: DISCUSSION

8.1 Introduction

The design of public convenience sanitaryware products and their usability should be viewed as being of great importance in the society we live in. This research has proved that many people are affected by these products in a variety of ways. The user-product interaction was a major focus of the research, it was essential to understand how people use the products, to understand how they were misused and how through understanding the users, designs could incorporate solutions for their needs.

The results from this research demonstrate greater autonomy is evident between users and products, than that which is limited to the physical ability of the users. Design should not be viewed as 'if it fits, it will work', as it has been confirmed that the body is not the only potential barrier when using public convenience sanitaryware products. This finding, along with others will be discussed in this chapter.

8.2 Physical and emotional needs

One of the interesting findings from this research was that much more than the user's physical capability was involved in the relationships that the users have with products. As a result, this research placed more emphasis on the need for investigation into the less tangible needs, requirements, concerns and aspirations of the users. As this was the focus of the research.

It was discovered that these emotional relationships users have with the products can, dictate the products usability; the user-product relationship was found to, render the items unusable by some of the participants. The results of this research suggest that the emotional relationship the users have with the products can be a greater influencing factor on the usability of the products than the user's physical ability, this is assuming that the users of these products are physically capable to interact with them. The strength of the user's emotional responses to the products was not predicted to be such an influential factor, in the user-product behaviour patterns at the outset of the project, or after conducting the main literature review.

This finding is, in part supported by some user-centred design literature which has previously identified that the users emotional needs should be seen as just as important as the users physical needs (McDonagh, Bruseberg and Haslam, 2002). However, it was not appreciated how important these needs were and that these emotional needs sometime supersede the physical needs.

8.2.1 The cognitive need for comfort

Comfort encompasses much more than just a physical sensation. It was found that for some participant's, cognitive comfort, peace of mind, was more important than the physical need for comfort, i.e. relieving the need to urinate, defecate, or change sanitary protection. It has been possible to identify several attributes for cognitive comfort; satisfying the users need for privacy, personal safety and perceived hygiene.

In one of the studies conducted for this research, it was found that 14% of the male and 57% of the female participants would crouch over toilet seats and this was due to hygiene concerns. The reasons suggested for not sitting were identified as being due to touch contact avoidance. In Moore's study it is unclear what the parameters were for the ethnographic description of British, so Moore's finding was viewed as a guide for this study, however it found that a minority, 2%, of women sat directly on the toilet seats (Moore *et al.*, 1991). Cai and You also found that their study, conducted in Taiwan, found 50% of their participants did not sit on sit-type toilets (Cai and You, 1998). Thought the investigations it was possible to identify several triggers of negative emotional reactions towards public convenience sanitaryware these were able to be put into five categories;

- **purpose** – considering the user's needs
  - access, functionality, usability
- **hygiene** – in use and maintenance
  - touch contact, perceived hygiene, personal hygiene
- **task** – physical interaction
  - personal belongings, children, human waste
- **privacy** – user preferences
  - visual, aural, odour
- **environment** – in which the user is to interact with the products
  - personal safety, crime

Perceived hygiene was the main requirement for both men and women from all of the public convenience sanitaryware products, in addition it was the main contributor to creating this cognitive sense of comfort. Perceived hygiene is what the participants describe; it is not possible to establish the 'real' hygiene levels so participants were only able to describe what, for them, created a sense of hygiene. This was achieved through the participants describing scenarios that led them to perceive a notion of and a lack of hygiene. Liquid was seen as a contributor to creating and destroying a sense of hygiene. Liquids were seen as clean when they were used to flush the toilet or urinal, but were seen as unhygienic if they were found anywhere away from their intended 'flush area'. Participants suggested, through their approaches to using the products, they would be prepared to sacrifice physical comfort for cognitive comfort. Cai and You (1998), who employed user-centred design methodologies for their research, discovered that the majority, 85%, of the users of toilet in public conveniences would be prepared to sacrifice physical comfort for hygiene.

8.3 Convenience avoidance

The user's psychological state of mind is, in some circumstances, the restricting element in the user-product relationship. This barrier may not be in anyway a physical impairment causing a limitation of ability, although it can be described as being at different degrees of cognitive severity, this was seen across what appeared to be the majority of the male and female participants. Some participants described their inability to use LA provided public conveniences as a psychological issue, which is greater than if they were using conveniences provided in a place of work or other more 'private' public locations. This usage was affected when using urinals and toilets. It was said, by some, to alter their behaviour and that they would choose to go at home or in a 'familiar' or more private setting. Participants described avoidance strategies, as well as, other coping mechanisms i.e. waiting until the convenience was empty of people to provide them with the ability to 'go'. Although the majority of the participants, throughout the investigations into user-product interaction, did not say they suffered from AP, some demonstrated a need for four requirements from the environment and products, these were for;

- an answer to the 'natural need' created by the body
- the means to maintain hygiene levels

- the ability to be able to perform the task within their physical capabilities
- their visit to provide them with privacy and reduced personal exposure

Through the investigations, specifically the interviews conducted for this research, several participants actively described public convenience avoidance, some participants referred to "*shy bladder syndrome*" or AP as a direct influence of this. Indeed, it was the male participants who specifically referred to this condition as one that affected their convenience usage. The literature claimed that this condition was more prevalent in men and described the avoidances as similar. When Soifer *et al* (2001) investigated the triggers of AP similar results were found but on a larger scale.

It was not the intention of the research to seek people who had this specific condition, but the research proves that even in a small sample, this condition affects several people in such a way that it does alter their quality of life. The research also proves that people are affected at a cognitive level when the user is otherwise 'fully capable' to use non-accessible specific public conveniences.

The emotional response and the physical ability of the users were identified as not being able to be treated as two separate entities, one was always dependent upon the other. It was the understandings of these measures that were presented in the pamphlet to the designers. For accurate user-centred design, more is needed to be understood by the designer than the rudimentary 5th to 95th percentile physical measurements of the user population. This anthropometrical data relating user-product interaction does not incorporate the less tangible boundaries. This can make it difficult for designers to understand their users. Only minimal amounts of data are available about the use of toilets. Kanis (1997), states that improved design outcomes can be achieved through understanding the product use process, by understanding the users.

8.3.1.1   Availability

The research highlighted and established that the users of public conveniences have observed a gender divide between the provisions for men and women. There was evidence that suggested men were provided with more facilities than women. It was felt by the participants that women often had to queue for toilets where as for men this is not something that commonly happens. The literature also suggested that more facilities, or more designs of facilities, were available

to men than women such as with designs like the UriLift® (The Economist, 2002 b).

Women commented more frequently than men that they felt the facilities they were provided in public conveniences did not take into account their needs as users. This is now possible to attribute this due to differences in use behaviour, between men and women in the environment of the public convenience. The user's needs should be addressed in any planning and design of public conveniences; architectural layout and product design. The designs should encourage use to either become quicker, which might not be realistically achievable, or, designers should be aware of the user's needs thus encouraging change in the recommendations set out in the British Standards to increase the numbers of provisions for women. By increasing the numbers this would then reduce the 'time difference' i.e. increase the provision, reduce waiting. BS 6465 state equal numbers of facilities must be provided in each gender. Yet this is only applicable to facilities installed after 2007 and not before. Equal does not and should not be limited to the 'same number of' facilities but should concentrate of providing peak-time human traffic to enter, use and exit the facility within the same time as each other. It must be made clear this is a request to increase numbers to provide equality in waiting time and not in numbers of provisions, this should not encourage a reduction in numbers of, or closures of male facilities to provide equality. People should not be inconvenienced similarly but should be aided equally.

8.3.1.2   Accessibility

The research also highlighted that the user's sense of comfort was also affected by the posture they adopt when urinating and/or defecating. Toilets in the UK are sit-type; this design has implications for the practicality of using the toilet for both men and women when urinating and defecating. Through the research, it was discovered that many users of sit-type toilets do not sit on them for a multitude of reasons, but very often, the participants attributed this avoidance to the perceived hygiene levels of the facilities. These concerns can, but not always, be attributed to why some men said they used urinals for urination. Men also commented that they sometimes use toilets as urinals for added privacy. Here it can be seen men have a choice over product use for urination, where as women are not provided with a choice but are still presented with similar use problems as the male users.

Posture can, for women, also be affected by the positioning of the sanitary waste unit in the cubicle. Female participants gave one of the reasons, for not sitting on the toilet seat, was that they did not want to touch the sanitary waste unit. The results from this research suggest there is often only very limited space available for women to sit down without having touch contact with the sanitary waste units. Recommendations made in BS 6465 Part 2 1996 (BSI, 1996) say that conveniences, intended for public use, should be larger to accommodate the user needs, and that in cubicles, in female public conveniences should be larger to provided more room due to the sanitary disposal unit to ensure that the unit does not touch the toilet seat. These standards are only enforceable from 1996 onwards and do not apply to conveniences built or renovated prior to this date. The standards are also only concerned with the touching of the toilet seat and do not consider the needs of the physical space the users body occupies.

It has not been possible, through this study, to recommend what posture the users should adopt, but it has been possible to educate designers to think about their user's capabilities and limitations. If users are unable to urinate effectively this causes them to be concerned about issues such as balance, dribbling on the toilet seat, missing the bowl, to mention a few. This then has implications for users who might use products but then avoid them, for these reasons. This is also possibly the case for other users who are to use the same products later on but do not want to touch the product due to seeing liquid on the seat, or because they have a notion that other peoples bodily fluids have been there previously. This suggests posture does have an influence on usability. Kira suggests that posture does not influence the act of urination but does affect the efficiency of defecation (Kira, 1976).

Physically accessing the products is also important for the participants who often described the items they commonly had with them; coats, cycle helmets, rucksacks, briefcases, laptops, food and clothes shopping' to mention a few. Participants expressed a need to be able to adapt the products they were presented with to their own personal requirements. This is not something that is available in present designs of the sanitaryware, or that is easy to achieve. This idea of 'adaptation' was one that was also identified by the designers from the information presented in the pamphlet and the it was found that the information engaged with the designers as these 'adaptable' choices were incorporated into the designs; support bars, seat covers, dual flushes; one on the top of the toilet and a pedal flush. As such, the designs that were produced offered the users

more alternative solutions to using sanitaryware product use than currently available. Participants accept that they are presented with multiuser public use products but would like to have different options made available to them for its use. This for men was the ability to choose between a urinal and a toilet for urination; however, this need for personal choice goes beyond this. Participants want to choice to reduce their touch contact with products when desired, and to increase privacy and usability. If designs were created that allowed for alternate or adaptable use, this would still be designing for correct usage.

Another discovery, through conducting the research, was that the participants commented on it being difficult to access towns and cities during the daytime as well as other difficulties when it was 'out of hours'. This has also been reported through research conducted by Greed (Greed, 2003 a). Participants of the studies also commented that different facilities were made available, or unavailable depending on the different groups people find themselves in, in society; if they had a career, if they were elderly, if they had a child (not a baby) accompanying them, to mention a few. Mothers and fathers commented on the difficulty of accessing adequate facilities for their children, and when accompanied by their children, and how this added extra complications to trips. Parents described that the cubicles do not provide enough room to undress and redress their child, and then for them to use the toilet with the parent helping, or there was not sufficient space for the parent to use the toilet while the child, who was accompanying them, was in the cubicle at the same time. The participants continued to say that sometimes they would plan their trips around visits to places where they would be able to use facilities provided by the privately provided public conveniences such as; shops, cafés and bars. The information from the research demonstrated scenarios where people described avoiding certain trips due to not wanting to be far from an accessible, in terms of available for use, toilet. These people felt there was a distinct lack of provision for these 'subgroups' within the male/female divide. This finding is also supported by research by Bichard *et al* (2006) where they have identified there is a lack of provision for people in these groups as well as specifically for the intended users of accessible public conveniences.

The results, presented in the pamphlet to the designers, succeeded in allowing the designers to create new solutions to the accessibility and acceptability issues of the users and these designs. This, in part, starts to create action for change by incorporating features into the designs that will hopefully 'encourage use and reduce misuse'. All of these barriers that prevent 'correct use' or user

desired use contribute towards a negative experience for the users and can hinder their ability to urinate and defecate, to the point that users who need to urinate and defecate will actively seek alternatives. For men needing to urinate this maybe a urinal chosen instead of a toilet and for men and women, it could mean avoidance of product use. Levinson (1999) also acknowledges 'avoidance techniques' and says that retaining urine in the bladder when it should be expelled can in turn increase the urge to urinate this can be a cyclical problem which could have no immediate answer if no alternatives are present, figure 8.1.
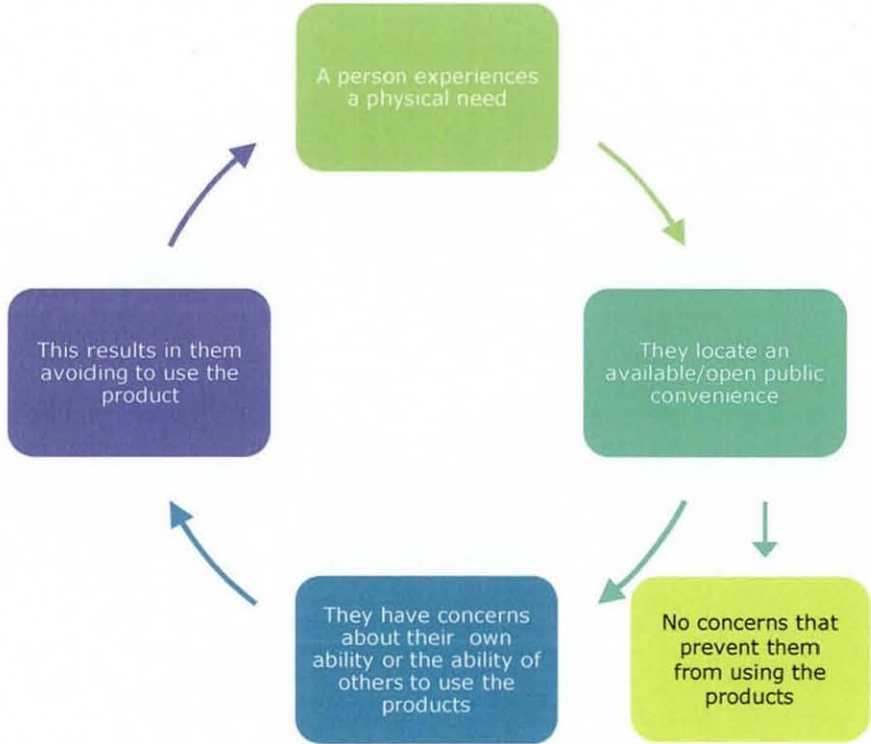
Figure 8.1: Cycle of use of public convenience sanitaryware products depending upon actual and/or received ability of self and others

8.4 Products designed for and with users

This study identifies that public conveniences are an essential part of many people's daily lives. This point has been previously argued by other researchers (Greed, 2003 b). For this research it was evident how important this subject was due to the success of participant recruitment for the studies conducted in this research and their responses to the surveys and interviews. The participants, in the interviews, described how they had observed a decline in

availability of LA public conveniences within the last twenty years, this again is supported by findings in the literature (DDA, 1995).

This research was able to ascertain that the current products available for use were not fully satisfying the needs of the users. The users who were interviewed and who took part in the surveys were relying on their memory to describe their representation of public conveniences; it is this memory and the associated emotions that were identified as being contributors leading to active use or avoidance. This research has, through understanding the user's needs; by means of investigation and analysis has meant that relevant information was able to be presented to designers. The designers described the pamphlet as a 'useful' format, which would actively encourage them to incorporate some of the identified user requirements into their designs.

The designs produced by the designers prove that alternative thinking can be encouraged through the chosen medium, the pamphlet, and this can result in 'new' designs. These new designs have the potential to engage with a wider user demographic and therefore this might go some way to encourage use of the products and perhaps as far as improving the lives of people who use and avoid these products at present. These designs, due to the way the designers used the information, also have the potential to offer solutions to the users less tangible needs; needs that are personal to many people yet that are shared across the population. These products could then be described as pleasurable and as representing and defining the users but on a national level, this would take the point made by McDonagh *et al* (2002) that products have the potential to represent an individual's to one of a national social status.

8.4.1 Material selection

The result of the research into the specific sanitaryware products suggested that the users tended to have personal preferences of which material the products were made of. This was especially evident with men, this material preference varied depending upon whether they are using a urinal to urinate or a toilet to either urinate or defecate. Participants described that commonly, urinals and toilets are manufactured from either, stainless steel or vitreous ceramic, plastics are often used for sanitary waste units and toilet seats, this finding was corroborated through the authors 'loo of the year' inspectors job.

Reasons given for individual user preferences of materials were personal to each user. Some prefer to have toilets and/or urinals made from stainless steel and gave reasons such as; stainless steel looks modern and evokes the feeling of cleanliness, due to the association of this material with hospital equipment, other people preferred vitreous ceramic because of its familiarity. Ceramic is the material people are used to in their own homes. As mentioned, sanitary waste units and toilet seats are commonly found made of plastics. Although some participants mentioned wood as a material for toilet seats, plastic was described as the preferred material for seats.

It was possible to conclude, from the research, several material properties that would be acceptable to users. Therefore, materials that do not satisfy these needs should not be considered for the production of the products. As discussed previously, users repeatedly expressed the need for hygiene, this was the main requirement for all three products investigated. Therefore, it can be concluded that materials that provide smooth surfaces, preferably with a gloss finish, as suggested by several participants, would provide them with the material properties they require, these properties are available from many different materials such as ceramic, polymers and stainless steel; these materials are already commonly in use. Hygiene would also incorporate designs that were 'easy to clean' by maintenance staff and by the users. Many of the users expressed their need to be able to assure themselves that the product they were using was, or perceived as clean. Cleaning, by the participant, was described as using toilet paper to wipe surfaces. Toilet paper was described in several different ways as a means to provide this assurance. Toilet paper was described as being used to;

- wipe the seat
- cover the seat by placing sheets of toilet paper on it before sitting
- cover users hands before touching the flush
- lift the seat to urinate (men)

Therefore, the material properties of the products would need to allow users to have the same assurance of perceived hygiene.

Material selection can also be affected due to the environment in which the products are housed. Vandalism was mentioned as a problem by the participants as this can have an effect on the materials chosen for the products. Some participants commented that they felt stainless steel was more indicative of vandal proof products and as such would be their material of choice, where

as other said stainless steel reminded them that vandalism is a concern when using public conveniences and this reminded them of personal security issues. Most of the vandalism spoken about was not vandalism to products but was more concerned about how it affected the environment in which the products were placed. Some participants described that they actively avoid certain public conveniences due to the premises being 'undesirable' to be in and attributed this to antisocial behaviour; crime and vandalism. This issue has been raised by Bichard *et al* (2006) where they have identified instances where products and environments suggest a defence against crime, yet this can be seen as providing a negative experience to users who would not cause crime. The participants of this research indicated a need to accept the design to reduce crime.

8.5 Usability

It was not just the access to, but also the use of, the facilities people found difficult. Both men and women spoke of space issues when accessing toilets in cubicles. This was mainly attributed to the space provided by the cubicle. Issues mentioned ranged from; broken locks on doors to toilet paper dispensers being placed on the wall behind them (above the cistern on the back wall), and how these issues affected toilet usage. This toilet usage then affected their behaviour, at times led to the misuse of the products. Women also commented they sometimes felt they were not provided with room due to the positioning of the sanitary waste unit. Other usability concerns were concentrated on issues to do with safety; of personal belonging and of the personal safety of the user. Personal safety was specifically mentioned by male participants when they use urinals as some men felt that the design of the urinal left them vulnerable to attack. In addition, men mentioned the proximity of the placing of the urinals in many conveniences as being too close to each other, when individual urinals and trough urinals did not allow enough privacy, as was the case with urinals without dividers. This led some men to choose to use toilets for urination.

The personal items users carry with them and their concerns of what to do with them when using the products was also a major consideration for them, be that for urinals or toilets. Participants described leaving items of value; laptops etc... at the sink areas, others described almost acrobatic balancing acts to avoid their items touching the floor and how some people were not prepared, due to

safety concerns, to use the hooks on the back of the door because of potential 'snatch and grab' scenarios. In addition, people described the reluctance to put items on the floor; in part, this was due to perceived hygiene concerns but also because of the potential for items to be stolen from under the cubicle dividers. During the summer of 2008, when the author was working for the British Toilet Association as a 'Loo of the Year' inspector, there was one instance of this happening in a facility only minutes before it was inspected. At other times there were serious concerns for the personal safety of the inspector and on one instance, at a LA Public Convenience the Police were called out due to an aggressive situation arising which was caught on CCTV by local security. The needs of the users, to feel safe so that they can use the products without fear for their items or for their personal safety are not mentioned in the British Standards, or literature as points to consider when designing these products. There is literature that recognises these buildings as places of antisocial behaviour (Bichard, Hanson and Greed, 2006) but this research does not provide solutions to help users cope with these concerns.

8.6 User-centred design research methods

In the interview with the designers from Twyford Bathrooms, they said that there was a lack of user-centred design in some sanitaryware design projects, specifically at 'budget' end as these projects are often driven by cost. They described how there is only "*so cheap a product can be produced*" and to gain added presence in the market place it is important to not think about reducing costs as the only selling point but about providing a better service to distinguish one brand and/or manufacturer from another. They described a need for this but a lack of information available to them. They agreed that user needs must be taken into account for their future designs to ensure the success of their products and their company.

Participants in these studies were all users and/or avoiders of public conveniences as such they were used to direct the research. As discussed by Norman (2005), it is necessary to consult with users, through the employment of user-centred design to alleviate the sense of 'helplessness' and providing them with the means to achieve the desired goal, this has been paramount to the success of this research. In order to achieve this, the research aimed at

understanding the users pre-existing knowledge and experiences (Kanis, 1997). This paved the way for designing for user acceptance.

Designers were encouraged with the provision of the pamphlet to empathise with the users' elimination needs and to design appropriate solutions. Results from the design exercise demonstrated that they, the designers, had been able to grasp an understanding of the users requirements and that the pamphlet was integral in this process, the designers themselves commented on this fact. Some designers claimed that they would have come to the same design solutions without the pamphlet; it is possible to see, from their designs, that there was a direct influence from the information in the pamphlet on the designs produced. However, all the results were essentially developments of the existing products. Interestingly the results did show that through the employment of the pamphlet, the designers were able to adapt the designs to incorporate some of the user requirements, thus showing empathy for the users. This can be seen as the first steps in an evolutionary process. This finding was, to a certain extent, as expected. Harper and Halestrap (1999) note in their book that the design of the toilet is very common and that designing anything different is a difficult task.

It is not possible to accurately predict the perceived reaction to the product as, so far, these designs have not been finalised, prototyped and tested. Unfortunately, they may still not answer all of user needs, however, it is felt that there has been definite progress in highlighting user need to designers. There will always be some people for whom the design guidelines and final design outcomes do not consider. Kanis (1997) wrote about how it is difficult to predict all user-product interaction.

It was also discovered that the participants did not want the designers to become over complicated or technical. This was a potentially difficult concept to present to the designers. However, through the creation of the pamphlet and the designers using this pamphlet it was possible to determine that this method of presenting the information not only engaged them but also facilitated their comprehension of the user's needs. Users wanted the designs to function in an obvious manner this can be achieved through understanding what the user already knows and using this as tool to create a more acceptable product. Veryzer *et al* (2005) talk about 'creating systems' that do exactly this.

8.7 Conclusion

The results discussed in this chapter offer the potential for designers to have the opportunity to respond to the needs of the users and incorporate their needs into the designs of future products. This subject should be viewed as being of great importance to all, as such user-product interaction was the main focus of the research so that the relevant information could be presented to the designers. The information also allows future research a starting point on which to base further investigations into design for user acceptance.

The research also highlighted that the cognitive or emotional relationships users have with the products was far more important than initially anticipated and that these reactions people have with the sanitaryware products can have a direct influence on the usability of them. It was also found that this emotional relationship the users have with the products could outweigh some of the physical abilities that the users had.

The process of collecting the data and then later presenting it to designers has proved to be successful through the design exercise this now provides opportunity for adapting and refining the information and presentation to the designers. It also empowers designers to think about the users and not just about cost or of the basic product requirements; removal of waste. This research allows designers to understand the users and incorporate their needs and aspirations into future products.

CHAPTER 9: CONCLUSIONS AND FUTURE WORK

9.1 Introduction

This chapter brings together the conclusions of the research conducted for this thesis. In this chapter, the aims and objectives of the research and how they have been achieved will be discussed. The resulting conclusions from the research, the limitations and successes, as well as, the contributions to new knowledge will also be presented.

9.2 Meeting the aim and achieving the objectives

It was essential to the success of this project that the research aim was met. To achieve this, several objectives were set out at the start of the research. These objectives were met at various stages of the research to strengthen its appropriateness.

The aim of the research was to; present designers with information to aid them when designing multiuser public use products, toilets, and sanitary waste units. This aim has been met through the completion of this research. Firstly, a literature review was conducted concerning the available literature in the area. This process helped identify areas for further investigation. Then four main studies were conducted. The objectives that were met and where they were achieved in the research are shown in table 9.1.

Table 9.1: Objectives met through conducting the research

To investigate current research into public sanitaryware provisions	✔	Chapter 2
To investigate and review the literature available within the main themes of; • the built environment • regulations and guidelines • environment • user health • product design	✔	Chapter 2
To identify areas of interest for further research	✔	Chapter 2

To elicit the needs of the users of public conveniences and the specific items being investigated	✔	Chapters 4 - 6
To identify the needs of the UK public and what they require from the public conveniences sanitaryware products	✔	Chapters 4 - 6
To create and validate a set of design guidelines for use by designers when designing future products	(✔)	Chapters 7

The last objective was to create and validate a set of design guidelines for use by designers when designing future products. Due to the limitations of the research (as discussed in Section 9.4) it has not been possible to fulfil this objective. However, it was possible to prove the success of the pamphlet in terms of it engaging with the designers.

9.3 Answering the research questions

Through conducting the research for this study, it was necessary to answer the research questions (as presented in Section 1.2.3). These have been addressed through conducting the studies presented in this thesis. A summary of the answers to the questions are available below;

1. The users of able-bodied access public conveniences in the UK have different requirements depending upon the elimination task and product and/or products that are presented. These products are dependent on whether the user selects to use a public convenience intended to be used by men or women. Another main requirement from both male and female users of public conveniences was that facilities were accessible and available to use. This does not just mean that the public convenience block need to be open, but the facilities inside it have to be presented to the users in a way that they find acceptable to use.

Toilets – The main requirement from male and female users was for effective removal of human waste; urination and defecation. However, there were other requirements that the users also expressed a need for;

Hygiene – users of toilets wanted to know that the product they were using was clean and at an acceptable standard for them to use, some users expressed how, even if they needed to use a facility, they would avoid using one if it was not at an acceptable level of hygiene for them to use.

Privacy- this was for visual, as well as, odour and audible privacy. The users expressed a need to remove and/or reduce the reminders they were in a public place performing a private task. They wanted to be concealed from other people and have other peoples presence obscured.

Safety- for women this need was more concerned with their personal belongings, whereas for men more emphasis was placed on the need for deigning out crime.

Urinals – The main requirement was the effective removal of urine. It was also important for men to have a choice of products available for them to use for urination; toilets or urinals. Other requirements were;

Privacy – this need mainly concerned the users need for visual privacy, specifically line of sight when in the act of urination. This was so the users would not feel exposed to other people when urinating.

Safety – this was concerned with the users' personal safety, specifically issues concerning physical contact from other users when using the urinals in a public convenience.

Sanitary waste units – The main requirement for sanitary waste units was to dispose of menstrual waste in a way that would not inconvenience the user or hinder future users. Other requirements were;

Hygiene – specifically to reduce touch contact with the unit, especially if the touch contact involved using their hands.

Usability – to allow for a system that would effectively remove sanitary waste so users do not have to see other peoples waste or, through poor design, leave their waste where it might be viewed by others.

Users of male specific public conveniences are provided with a choice of either the sit-type toilet or urinal. It appeared important for them to have this choice, especially if the users required the extra privacy that would be afforded to them through using a toilet in a cubicle. However, users of female specific public conveniences only have the option of a sit-type toilet. Women mentioned wanting to be provided with a choice with respect to deciding how to use the product. There are differences in product use dependent upon gender. This difference does affect the users, mainly through the types of products made available for them to use in the gender specific public conveniences. Women are also provided with sanitary waste units; these products have an effect on the

usability of the toilet and therefore can create different 'in use' scenarios with the same product, the toilet, had the unit had not been there.

2. The products; sit-type toilet, urinal and sanitary waste unit fail to meet the needs of the public because they are not seen as desirable items to use. Part of the reason for the products being undesirable to use is that the end users, the UK public, have not been consulted in the decision process of what and how these products should be designed, and what features should be incorporated to make the in-use process more enjoyable. Users have also not been consulted on the range of products available to them, which of these products are needed and how they are provided and presented to the users.

3. The user requirements of the products can be met through effective product design if designers are given the tools and the information to understand the users of the products, which they are designing. User needs must be researched and then presented to the designers in a medium that is accessible for them to interpret and which encourages them to engage with the users. This was partly achieved through the creation of the pamphlet.

4. Product designers can be aided when designing public convenience products by being encouraged to engage with the users of the products. This can be achieved through representing their needs and emotional aspirations, as well as highlighting the situations the users of the products are in; do they have shopping bags, coats, walking sticks, are they accompanied by other people. Product designers must empathise with the users and think about their in-use situation. This was partly achieved through the inclusion of the two pictures in the pamphlet, one showing a group of potential users and the other, showing in-use scenario positions the body can adopt depending on the gender of the user and their physical ability.

9.4 Conclusions

Through conducting and completing this research project, it was possible to conclude several results in relation to the objectives presented at the start of this project. Additionally there were some extra findings to those set out in the initial objectives.

The literature review (Chapter 2) highlighted a distinct lack of user-centred design in the design of public convenience sanitaryware products. It was

discovered that research into public conveniences had been previously explored but from a different perspective to that of product design. There was also very limited understanding and research into developing products that are to be used by the public, specifically multiuser public use products. The research project addressed this void in the knowledge by investigating the UK public's needs from the products at use level, emotionally as well as practically. There were also no tools found to help designers empathise with their users, in this scale, that of a whole population.

There is little or no research presently available in this field of public convenience sanitaryware design. Research concerning the usability of the products has largely been overlooked and there was no information about this for able-bodied users of public conveniences. The problems the users of public conveniences face has now been identified as not being necessarily attributed to physical access to the facilities. This aspect of the design had not been previously addressed. It was discovered that the physical ability of the user is limited by the physical space provided to them but also it is affected by their emotional relationship with the products. Users of public convenience sanitaryware products can feel that they are prohibited from using the products because of hygiene and personal safety concerns, more so than of physical ability.

It was felt it was necessary to investigate the needs of the users from a gender perspective to ascertain if there were differences in use and user requirements. It was also deemed necessary to separate the different facilities, home, all 'away from home' and LA public conveniences to understand the user's needs. Therefore, from the literature review it was decided to concentrate upon LA public conveniences in relation to gender and user needs. Only one type of toilet was discovered for UK public convenience use, the sit-type, along with urinals and sanitary waste units. Urinals and sanitary waste units were included in the research as it became apparent that depending on the gender of the user, these products were inextricably interlinked in the choices made concerning the use of toilets.

The research also received great support from the public, for whom this research was intended. This is evident from the relative ease of recruitment for this research, over 450 people, without needing any incentives participated, this proved the need for research into this subject as there was a public demand to participate. Throughout the research conducted for this thesis, people have

been focused at the centre of every decision. This research was user-centre based and relied heavily on people participation. The research project was specifically focused on gathering information about multiuser public use products;

- toilets,
- urinals
- sanitary waste units

It was necessary to present the findings of the research, to express the concerns of the users of the products, in a way that engaged with designers.

Industrial product designers were also keen to learn about their users and engage with them. This was evident from their participation and then through the results of the follow up interviews. Industrial designers responded positively to the pamphlet and the information contained within it. It is not possible, to tell from the results of the research, if the designs produced by the designers in conjunction with the pamphlets would be acceptable to users. This is due to limitations of the project namely time and money. However, relative success can be attributed to these designs as the information presented was based on the data collected from the participants who took part in and directed the research. The researcher has investigated the designs and has been able to conclude that the designers did incorporate many of the requested changes to the designs and that the designers had considered some of the wider needs of the users. Through the research it was identified that there were seven main areas that would need to be addressed to fulfil the user's needs these were;

- physical need for elimination
- physical need for changing sanitary pads/tampons
- hygiene
- user choice
- availability
- mind set
- safety

Designers also commented that they felt they do not always have the recourses to investigate the users, design is often driven by time and monetary constraints. The information presented in the pamphlet proved useful in broaching this knowledge gap.

The work for this project can be viewed in two ways;

1. it is a study for a very specific consumer need
2. it is a way of investigating one subject matter that could ultimately be used to investigate other products for a very large and diverse user group

The findings in this instance are, the author believes, to be viewed as part of both of these viewpoints. The study is about the specific needs of users of public convenience sanitaryware and this is a niche subject. However, the main stakeholder investigated, the UK public is a super-sized consumer group. The emphasis was on representing the user needs in a way that would communicate with designers and encourage them to design for other people with different and varied needs. This resulted in streamlining the information that was presented to the designers so that they could explore the subject area without being overwhelmed by too much information, yet to provide them with enough information to engage them with the users and their needs, this was achieved.

As such, it can be concluded that the research conducted through this study and presented in this thesis has been successful because it has challenged the subject and provided a result. The challenge was understanding the needs of the users and then to present this information to the designers. As this was user-centred based research this was achieved, as the researcher had a background in Industrial Design it was also possible to interpret the data in a way that would engage with the designers in the design exercise. This was proved through the testing and analysis of the results from the pamphlet.

The outcome of this study was a set of information presented to designers to engage with them when designing solutions to the specific elimination needs of the users in public conveniences. It was necessary to test the appropriateness of this conclusion to the information. Firstly, a pamphlet was designed; in it, selected information was presented to designers to allow them to see the scope of the user's needs. Through the design exercise, it was possible to determine that the pamphlet did engage with the designers. The pamphlet also succeeded on several other levels but it was also limited by the nature of the layout of the information.

The success of the pamphlet can be seen in several ways as described;
- during the design exercise, different industrial product designers from across the discipline used the pamphlet. The pamphlet was, in most cases, seen by the designers as a useful tool for designing products for this market.

- the pamphlet was, in the design study, to be 'used as if in an industrial project'. This left the designers with the scope to work with it on an individual basis or to use it in a group. It was used in both ways and in several cases a crossover of the two. This proved its ability to be versatile in the working environment.
- the designers commented on its usefulness and in some instances, this was said to have led to design outcomes they do not think they would have achieved without the pamphlet. Other designers felt educated by the pamphlet, particularly about the needs of the opposite gender to themselves.
- the tool, once created is a cheap and quick way of presenting the information to designers and would be an appropriate format to produce information about other products.

9.5 Limitations

The results do not satisfy or represent any one individual, but are intended as a representation of the UK public as a whole. The data has been collected and analysed by only one researcher to avoid conflicts and it has been possible through this approach to apply an unbiased translation of the data. The results are not presented in the way of a 'new design' but as a guide to help designers.

It could be argued, by some, that this research is biased, based on the demographics of the participants involved. This potential limitation was identified and, addressed, as so far as possible, in the studies. This bias is believed not to be evident in the second study conducted, however it might be in the interviews and the design exercise. This was partly due to the time limitations and the self-selection method for recruiting participants. As such, it may be felt that in some instances minority groups were not consulted for the study. This was not the intention of the researcher, but a limitation of the study.

Due to the nature of the research, being user-centred, it is possible to conclude that although the representation of the participants might not accurately represent the views of the UK as a whole the data is true to the participants who took part in the study. As such, the data is as accurate as possible.

Limitations of the pamphlet - It was accepted that the information presented in the pamphlet would be the results of the research to date; it would be the

areas and points that had the most emphasis placed upon them. This however, due to the sampling of the participants is limited or inaccurate. A further study would have to be conducted to corroborate these findings as true or as a misrepresentation. However, no information is available to compare these findings with and as such, this research is a good starting point for any further investigations. Some of the limitations were;

- the pamphlet failed to engage fully with all designers and this was attributed to the design of the layout
- the pamphlet was not produced to the intended level of quality
- the level of detail in the pamphlet was more basic than hoped for
- some designers would require higher levels of information, this could be achieved in other formats but not in a paper pamphlet.

It is therefore possible to say that within the scope of this project, and despite the limitations, the usability of the pamphlet was a success with the designers. It was well received and was used to create designs that challenge the 'norm' by incorporating the design features that could ultimately lead to a change for the better for the consumers as the design changes are based upon the direct results of the information elicited from the participants, the UK public.

9.6 The contribution to new knowledge

This research has contributed to new knowledge by providing three alternative ways to interpreting the needs of the users of public convenience sanitaryware products in the UK, as well as highlighting the importance of the issue amongst designers. Firstly, it is now possible to provide industrial product designers with a clear understanding of the user's needs from these products, this is in the form of a pamphlet. Secondly, the information has been peer reviewed and is also available in that format. Finally, the doctoral thesis is now available to provide a more in-depth insight into the needs of the users.

The studies have been used individually and together to highlight a wide range of issues that affect the 'every day' lives of people in the UK. The research was able to identify key points, such as hygiene, privacy and security issues that greatly affect users. However, the research went beyond this and provided the background information that can be used in a practical sense. Although the issue, for example, is hygiene the causes of this are now better understood. It is possible to determine that providing more space and less touch contact,

hands and body, would help overcome this issue. This information can then be use by designers to design products that take into account the real needs.

The pamphlet was successful in providing designers with a new and innovative way of accessing the required information to aid them with the design of the products through engaging with them and encouraging them to interact with the information. The presentation of the information provides the designers with clear boundaries of what is required to achieve the desired outcomes from elimination of body waste. This helps designers understand the boundaries that the users require and it is not driven by any other limitation e.g. money. The major limitation is now focused upon the ability of the designer to design, as the limitation of the designer to engage with the users, has been removed.

The research for this thesis has also highlighted a need to understand designers as well as users. Although this research project was focused on user needs and requirements all the data would be unusable if it was not presented to designers in an accessible format. However, designers will not use this information or accredit it if there is no evidence for its need. All of the background work is also available for them to read, either through pier reviewed publication or by request. This highlights that there is real need and reason for the research. The popularity of the research, proved through the high response rate to calls for participation also adds strength to this need. This in its own right also contributed to the knowledge that the users of public convenience sanitaryware products were not satisfied, in the main, with the provisions they are provided. The research was more through than that and has identified the areas that the users are displeased with. Evidence of these areas are present thought this thesis, also the research highlighted the aspects of the provision users were pleased with. This provides the building blocks for improvements. One of the main achievements and contributions to new knowledge this research has had, is it has proved that it is time for a change and to listen to consumers, to stakeholders and providers and to prioritise the 'small issues' such as toileting needs, as these needs have a huge impact on peoples' lives and wellbeing.

To conclude, the work presented in this thesis provides the groundwork in a niche subject that although 'small' in terms of research output in this field; it is in no means 'small' in its magnitude on the daily lives of the users. The research provides the foundations for future work in the area of public

convenience sanitaryware design or indeed, it could be used to look at other multiuser public use products as a basis for the methodology.

9.7 Future work

The research presented in this thesis, although complete in terms of fulfilling the aim and objectives set out in the introduction (Chapter 1) can be seen as the starting point for future projects. From the research there have been many questions raised along the way, some, have not yet been answered.

Future research could involve looking at each gender and their individual needs separately. It might also include a more clearly defined breakdown of the different sub-groups within these genders; this could be done by age, or through other further sub-divisions such as parent, carer, transgender, religion, economic background to mention a few. To achieve this, a larger sample of the UK population would need to be included; a larger team of people and a bigger budget to complete the study; and, more detailed and precise information would need to be elicited.

A second study could be undertaken to consider other multiuser public use products and develop the methodologies employed in this research to investigate user needs of different products. This may, or may not create parallels with this project through the user requirements of the products.

It is however clear, that this subject area is greatly overlooked by industry, planners and researchers. It would also be interesting to teach 'new designers' about the needs of mass consumers, to broaden their thinking about target audiences and to include this information in a generic sense as part of the education of new designers. This would promote new design that considered the benefits of designing for outside the 'high end' market and products that will include people through design and not exclude them. By designing with people, rather than excluding them from the process until the evaluation of the product, proactive user-centred design would avoid many of the issues faced by consumers. If designers understood this and employed this methodology, improved products would be developed with a resulting improvement in the quality of life. However, perhaps in the future the design initiatives from projects such as this can be used to allow users to adapt the products to their specific needs, as is the case with the levels of user adjustment incorporated in

some accessible design for disabled users such as the FRR (Panek P., *et al.*, 2004).

For this to happen, investment or legislation, needs to be instilled to be the catalyst for change. Until this is available, it is important to engage with designers to encourage them to think about users as people and to try to incorporate the action for change through small adaptations such as the ones presented in chapter 6. These adaptations might, if prototyped, piloted and manufactured encouraged use and reduce misuse, therefore action the investment needed to change the image of public convenience sanitaryware design in the future.

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APPENDIX 1: INITIAL EXPLORATORY STUDY; MALE & FEMALE QUESTIONAIRES

This questionnaire forms a part of a research project investigating the effects of the design of sanitaryware, for the public domain, on the physiological and psychological wellbeing of the users with specific reference to gender.

This Survey is aimed at people aged 18 to 65 only. If you are under 18 or over 65 please do not fill in this survey.

Public Toilets for this survey are all toilets/urinals that are not at home or not in the home of someone else: Public Toilets may be found in; Bars/Pubs, Private Clubs [e.g. Golf, Sports or Social], Night Clubs, Restaurants, Service Stations, Shopping Centres, Places of work or study as well as the council run or 'on-street' public conveniences.

Please answer the questions as appropriate with either a tick or enter your comments in the boxes provided.

This survey contains 37 questions and should take you about 5 minutes to complete.

All information gathered is anonymous, your name will not be asked for. At the end of the survey is the option to send us your email address for further research. This is the only way of identifying who has participated, we will not disclose the identities of any participants in this study.

If you have any questions about the survey you wish answering prior to taking part please email me at: e.y.williams@lboro.ac.uk

Thank you for your assistance.

Gender

Male	Female
Clicking this button redirected male participants to the survey aimed at men	Clicking this button redirected female participants to the survey aimed at women

Note: You are free to withdraw from this survey at any time by not completing or pressing the 'reset' button on the following page.

The information given in this survey may be published, however no information leading to the identification of a participant will be published.

If you submit a survey and wish to have the information withdrawn and destroyed at a further date, please email e.y.williams@lboro.ac.uk and this can

be arranged also if you would like a copy of your own data proof of you submitting the data will be required.

Male Questionnaire

About You

1. How old are you?

   [DD ▼] / [MM ▼] / [YYYY ▼]

2. Occupation?

   [Please Select ▼]

3. Weight

   [12 ▼] st [0 ▼] lb or [____]kg

4. Height

   [5 ▼] ft [5 ▼]in or [____]cm

5. Clothes Size

   Chest [39 - 41 ▼]in [____]cm

   Waist [33 - 35 ▼]in [____]cm

Disabilities and Accessibility Issues

6. Do you require the use of disabled access toilets and if so why?

   ⊙ Yes [_____]

   ⊙ No

7. Do you generally have any other difficulties in using public toilets, if the answer is yes the why?

   [This does not include physically accessing public toilets]

   ⊙ Yes [_____]

   ⊙ No

Personal Preferences

8. Where are you most likely to use a public toilet please select 2 options?

   ⊙ ⊙ Bar/ Pub

   ⊙ ⊙ Club [e.g. Sports/ Private]

   ⊙ ⊙ Night Club

   ⊙ ⊙ Restaurant

   ⊙ ⊙ Shopping/ Town

Centre

○　○　Work/ Place of Study

○　○　Other

[   ]

9.　Would you try to avoid public toilets if at all possible and why?

○　Yes　[   ]

○　No

10.　What are your general perceptions of public toilets?

[   ]

11.　What do you think makes a good public toilet?

[   ]

12.　What do you dislike in a bad public toilet?

[   ]

Please can you answer the following questions sections in relation to the last 3 Public Toilets you used.

The Facility Selection

13.　Where have your 3 most recent visits to a public toilet been?

1st　2nd　3rd

○　○　○　Bar/ Pub

○　○　○　Private Club [e.g. Sports/ Private]

○　○　○　Night Club

○　○　○　Restaurant

○　○　○　Shopping/ Town Centre

○　○　○　Work/ Place of Study

○　○　○　Other
[   ]

14.　What type of facility did you use?

1st 2nd 3rd

◌ ◌ ◌ Able Bodied

◌ ◌ ◌ Disabled/ Accessible

◌ ◌ ◌ Other
              ┌─────────────┐
              │   │
              └─────────────┘

15.   What gender selection did you make?

1st 2nd 3rd

◌ ◌ ◌ Male

◌ ◌ ◌ Unisex

16.   What style of facility was it?

1st 2nd 3rd

◌ ◌ ◌ Sit type toilet

◌ ◌ ◌ Urinal

◌ ◌ ◌ Urinal   with
          separators

◌ ◌ ◌ Baby change

◌ ◌ ◌ Other
              ┌─────────────┐
              │   │
              └─────────────┘

17.   If there was more than one toilet/ urinal available for use which one did you choose and why?

1st ┌──────────────────────────────────────┐
     │   │

2nd ┌──────────────────────────────────────┐
     │   │

3rd ┌──────────────────────────────────────┐
     │   │

The Surroundings

18.   Was the facility in a cubicle?

1st 2nd 3rd

◌ ◌ ◌ Yes

◌ ◌ ◌ No [if the answer is no proceed to question 22]

19.   Did the cubicle provide you with enough space to enter and exit comfortably?

1st 2nd 3rd

○ ○ ○ Yes

○ ○ ○ No

20. Was there a sanitary towel bin in the cubicle?

1st 2nd 3rd

○ ○ ○ Yes

○ ○ ○ No [if the answer is no proceed to question 22]

21. Was there enough room between you and the sanitary towel bin to have allowed you to sit down without having any touch contact with the bin?

1st 2nd 3rd

○ ○ ○ Yes

○ ○ ○ No

Cleanliness

22. Did the facility appear clean?

1st 2nd 3rd

○ ○ ○ Yes [if the answer was yes proceed to question 25]

○ ○ ○ No

23. If the answer was no, how was the facility dirty?

1st 2nd 3rd

☐ ☐ ☐ Bowl

☐ ☐ ☐ Seat

☐ ☐ ☐ Floor

☐ ☐ ☐ Other _____

24. Did you attempt to clean the facility prior use?

1st 2nd 3rd

○ ○ ○ Yes

○ ○ ○ No

Use

25. What did you use the toilet to do?

1st 2nd 3rd

☐ ☐ ☐ Bodily   Functions

[Defecate/Urinate]

☐ ☐ ☐   Baby Change

☐ ☐ ☐   Hide/   Personal
         Safety

☐ ☐ ☐   Rest

☐ ☐ ☐   Telephone
         Conversation

☐ ☐ ☐   Other
         [_____]

26.   What main position did you assume when using the facility?

1st 2nd 3rd

○   ○   ○   Standing facing the wall

○   ○   ○   Standing facing out

○   ○   ○   Hovering

○   ○   ○   Sitting with the lid closed

○   ○   ○   Sitting on the seat lid open

○   ○   ○   Squatting

○   ○   ○   Other
             [_____]

27.   Did you wipe yourself after using the facility?

1st 2nd 3rd

○   ○   ○   Yes

○   ○   ○   No [if the answer was no proceed to question 29]

28.   If you did wipe yourself did you change your position?

1st 2nd 3rd

○   ○   ○   Yes

○   ○   ○   No

Toilet Paper

29.   Was toilet paper provided?

1st   2nd   3rd

◌   ◌   ◌   Yes

◌   ◌   ◌   No

◌   ◌   ◌   Do not know

30.   Did you take toilet paper with you to the toilet?

1st   2nd   3rd

◌   ◌   ◌   Yes

◌   ◌   ◌   No

31.   If it is usual for you to carry toilet paper with you why is that?

1st [   ]

2nd [   ]

3rd [   ]

32.   Did you flush the toilet/ urinal?

1st   2nd   3rd

◌   ◌   ◌   Yes [if the answer was yes proceed to question 34]

◌   ◌   ◌   No

33.   If the answer was no why did you not flush?

1st [   ]

2nd [   ]

3rd [   ]

Hand Washing

34.   Did you wash your hands?

1st   2nd   3rd

◌   ◌   ◌   Yes [if the answer was yes proceed to question 36]

◌   ◌   ◌   No

35.   If the answer was no, why did you not wash your hands?

1st [   ]

2nd [   ]

3rd [   ]

36.   How did washing or not washing your hands make you feel?

1st [   ]

2nd [   ]

3rd [   ]

37. How did you dry your hands?

1st [   ]

2nd [   ]

3rd [   ]

End of Survey

If you feel you may wish to further contribute to the research please leave your

email address [   ]

By leaving your email you are agreeing that I, Elaine Williams, may contact you in respect to my research. If you change you mind and would not wish to be contacted further please email me to let me know. Your email will not be given out to any 3rd parties and all information is treated as confidential and will only be used in conjunction with my research. No information identifying a participant will be made available to anyone other than myself.

Thank you

[Submit] [Reset]

Female Questionnaire

<u>About You</u>

1. Date of birth?

    | DD ▼ | / | MM ▼ | / | YYYY ▼ |

2. Occupation?

    | Please Select ▼ |

3. Weight

    | 12 ▼ | st | 0 ▼ | lb   or | ____ | kg

4. Height

    | 5 ▼ | ft | 5 ▼ | in   or | ____ | cm

5. Dress size

    Top | 14 ▼ |

    Bottom | 14 ▼ |

<u>Disabilities and Accessibility Issues</u>

6. Do you require the use of disabled access toilets and if so why?

    ○   Yes | _____ |

    ○   No

7. Do you generally have any other difficulties in using public toilets, if the answer is yes then why?

    [This does not include physically accessing public toilets]

    ○   Yes | _____ |

    ○   No

<u>Personal Preferences</u>

8. Where are you most likely to use a public toilet please select 2 options?

    ○   ○   Bar/ Pub

    ○   ○   Club [e.g. Sports/ Private]

    ○   ○   Night Club

    ○   ○   Restaurant

    ○   ○   Shopping/ Town Centre

⌐ ⌐   Work/   Place   of Study

⌐   ⌐   Other

[   ]

9.   Would you try to avoid public toilets if at all possible and why?

⌐   Yes   [   ]

⌐   No

10.   What are your general perceptions of public toilets?

[   ]

11.   What do you think makes a good public toilet?

[   ]

12.   What do you dislike in bad public toilets?

[   ]

Please can you answer the following questions sections in relation to the last 3 Public Toilets you used.

The Facility Selection

13.   Where have your 3 most recent visits to a public toilet been?

1st   2nd   3rd

⌐   ⌐   ⌐   Bar/ Pub

⌐   ⌐   ⌐   Private Club [e.g. Sports/ Private]

⌐   ⌐   ⌐   Night Club

⌐   ⌐   ⌐   Restaurant

⌐   ⌐   ⌐   Shopping/ Town Centre

⌐   ⌐   ⌐   Work/ Place of Study

⌐   ⌐   ⌐   Other

[   ]

14.   What type of facility did you use?

1st   2nd   3rd

○ ○ ○   Able Bodied

○ ○ ○   Disabled/ Accessible

○ ○ ○   Other
[_____]

15.   What gender selection did you make?

1st 2nd 3rd

○ ○ ○   Female

○ ○ ○   Unisex

16.   What style of facility was it?

1st 2nd 3rd

○ ○ ○   Sit type toilet

○ ○ ○   Urinal

○ ○ ○   Urinal   with
separators

○ ○ ○   Baby change

○ ○ ○   Other
[_____]

17.   If there was more than one toilet/ urinal available for use which one did you choose and why?

1st [_____]

2nd [_____]

3rd [_____]

The Surroundings

18.   Was the facility in a cubicle?

1st 2nd 3rd

○ ○ ○   Yes

○ ○ ○   No [if the answer is no proceed to question 22]

19.   Did the cubicle provide you with enough space to enter and exit comfortably?

1st 2nd 3rd

○ ○ ○   Yes

⌐ ⌐ ⌐ No

20. Was there a sanitary towel bin in the cubicle?

1st 2nd 3rd

⌐ ⌐ ⌐ Yes

⌐ ⌐ ⌐ No [if the answer is no proceed to question 22]

21. Was there enough room between you and the sanitary towel bin to have allowed you to sit down without having any touch contact with the bin?

1st 2nd 3rd

⌐ ⌐ ⌐ Yes

⌐ ⌐ ⌐ No

<u>Cleanliness</u>

22. Did the facility appear clean?

1st 2nd 3rd

⌐ ⌐ ⌐ Yes [if the answer was yes proceed to question 25]

⌐ ⌐ ⌐ No

23. If the answer was no, how was the facility dirty?

1st 2nd 3rd

⌐ ⌐ ⌐ Bowl

⌐ ⌐ ⌐ Seat

⌐ ⌐ ⌐ Floor

⌐ ⌐ ⌐ Other
⌐‾‾‾‾‾‾‾‾‾‾‾‾

24. Did you attempt to clean the facility prior use?

1st 2nd 3rd

⌐ ⌐ ⌐ Yes

⌐ ⌐ ⌐ No

<u>Use</u>

25. What did you use the toilet to do?

1st 2nd 3rd

☐ ☐ ☐ Bodily Functions [Defecate/Urinate]

☐ ☐ ☐ Baby Change

☐ ☐ ☐ Hide/ Personal Safety

☐ ☐ ☐ Menstruation

☐ ☐ ☐ Rest

☐ ☐ ☐ Telephone Conversation

☐ ☐ ☐ Other
_____

26. What main position did you assume when using the facility?

1st 2nd 3rd

○ ○ ○ Standing facing the wall

○ ○ ○ Standing facing out

○ ○ ○ Hovering

○ ○ ○ Sitting with the lid closed

○ ○ ○ Sitting on the seat lid open

○ ○ ○ Squatting

○ ○ ○ Other
_____

27. Did you wipe yourself after using the facility?

1st 2nd 3rd

○ ○ ○ Yes

○ ○ ○ No [if the answer was no proceed to question 29]

28. If you did wipe yourself did you change your position?

1st 2nd 3rd

○ ○ ○ Yes

○ ○ ○ No

<u>Toilet Paper</u>

    29.   Was toilet paper provided?

1st 2nd 3rd

◦   ◦   ◦   Yes

◦   ◦   ◦   No

◦   ◦   ◦   Do not know

    30.   Did you take toilet paper with you to the toilet?

1st 2nd 3rd

◦   ◦   ◦   Yes

◦   ◦   ◦   No [if the answer was no proceed to question 39]

    31.   If it is usual for you to carry toilet paper with you why is that?

1st
2nd
3rd

    32.   Did you flush the toilet/ urinal?

1st 2nd 3rd

◦   ◦   ◦   Yes [if the answer was yes proceed to question 34]

◦   ◦   ◦   No

    33.   If the answer was no why did you not flush?

1st
2nd
3rd

<u>Hand Washing</u>

    34.   Did you wash your hands?

1st 2nd 3rd

◦   ◦   ◦   Yes [if the answer was yes proceed to question 36]

◦   ◦   ◦   No

    35.   If the answer was no, why did you not wash your hands?

1st

2nd [   ]

3rd [   ]

36. How did washing or not washing your hands make you feel?

1st [   ]

2nd [   ]

3rd [   ]

37. How did you dry your hands?

1st [   ]

2nd [   ]

3rd [   ]

End of Survey

If you feel you may wish to further contribute to the research please leave your email address [   ]

By leaving your email you are agreeing that I, Elaine Williams, may contact you in respect to my research. If you change you mind and would not wish to be contacted further please email me to let me know. Your email will not be given out to any 3rd parties and all information is treated as confidential and will only be used in conjunction with my research. No information identifying a participant will be made available to anyone other than myself.

Thank you

Submit | Reset

APPENDIX 2: ONLINE AND ON-STREET SURVEY

Male Survey

About the Toilet

(please tick one box which applies to each option)

n/a=not applicable

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	n/a
Generally, in Public Conveniences there is a free toilet for me to use.						
It does not cause me a problem if other people are around when I am using the toilet.						
Splash back is a concern of mine when using public toilets.						
My general perception of public toilets is a negative one.						
Public toilets are generally, at an acceptable level of hygiene.						
When I start and stop urinating from a standing position, urine lands on the rim of the toilet seat or on the floor.						
Cubicles do not provide me with adequate privacy from other people.						
I find using public toilets a pleasant experience.						
When I have to hover over a toilet seat I find it easy to do.						
My general feelings towards toilets in public conveniences are positive.						
I never experience any problems from splash back.						
I expect to have to wait to use a toilet in a public convenience.						
Using public toilets causes me emotional distress.						
When I use a sit-type toilet, I normally hover over the seat						

because I am concerned about the hygiene levels.						

From a public toilet I require...

(Out of the following options circle/tick as many as apply)

Comfort	Hygiene	Extra support (e.g. hand rails)	Ease of use	Contemporary Styling
More space in the cubicle	No Splash Back	Child Friendly Facilities	Reduced Sound	Other:

3) If I could make a comment, suggestion and/or observation about the design of toilets in public conveniences it would be...

PTO

4) About Urinals

(please tick one box which applies to each option)

n/a=not applicable

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	n/a
Urinals are easy to use.						
I always use urinals rather than toilets if at all possible.						
It is hard not to get splash back from urinals.						
I do not mind using urinals when other people are in the vicinity.						
I prefer to use toilets to urinals for urination.						
I dislike other people to be present when I am using a urinal.						
When I start and stop urinating, urine lands on the rim of the urinal or on the floor.						

5) From a urinal I require...

(Out of the following options circle/tick as many as apply)

Comfort	Hygiene	A minimum of shoulder to knee privacy panels	Ease of use	Contemporary Styling
Urinals in cubicles	No Splash Back	Child Friendly Facilities	Reduced Sound	Other:

6) If I could make a comment, suggestion and/or observation about the design of urinal in public conveniences it would be...

7) If you have a disability, can you please state your disability.

8) Age – (This question is used to validate the cross-section of society asked)

Under 18	18 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 65	Over 65

9) If you practice/follow a religion can you please state which one – (This question is used to validate the cross-section of society asked)

Atheism	Christianity	Judaism	Buddhism	Hinduism	Islam	None
Other:						

11) If you feel you may wish to further contribute to the research please leave your email address

@

Thank you for taking part in the **Toilet-Talk.co.uk** on-street survey.

Female Survey

About the Toilet

(please tick one box which applies to each option)

n/a=not applicable

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	n/a
Generally, in Public Conveniences there is a free toilet for me to use.						
It does not cause me a problem if other people are around when I am using the toilet.						
Splash back is a concern of mine when using public toilets.						
My general perception of public toilets is a negative one.						
Public toilets are generally, at an acceptable level of hygiene.						
It is difficult to aim when urinating into a toilet from a hovering position.						
Cubicles do not provide me with adequate privacy from other people.						
I find using public toilets a pleasant experience.						
When I have to hover over a toilet seat I find it easy to do.						
My general feelings towards toilets in public conveniences are positive.						
I never experience any problems from splash back.						
I expect to have to wait to use a toilet in a public convenience.						
Using public toilets causes me emotional distress.						
When I use a sit-type toilet, I normally hover over the seat because I am concerned about the hygiene levels.						

2) From a public toilet I require... (Out of the following options circle/tick as many as apply)

Comfort	Hygiene	Extra support (e.g. hand rails)	Ease of use	Contemporary Styling
More space in the cubicle	No Splash Back	Child Friendly Facilities	Reduced Sound	Other:

3) If I could make a comment, suggestion and/or observation about the design of toilets in public conveniences it would be...

4) About Sanitary Towel Bins (please tick one box which applies to each option)   n/a=not applicable

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	n/a
Sanitary towel bins are very convenient.						
I prefer to use a sanitary towel bin in public conveniences than a bin at home.						
I feel that sanitary towel bins cause me an inconvenience when using a toilet.						
Sanitary towel bins are pleasant to use.						

PTO

5) From a sanitary towel bin I require... (Out of the following options circle/tick as many as apply.)

Not having to touch the bin	Contemporary styling	Ease of use
More space in the cubicles	Safe storage of sanitary items	Other:

6) If I could make a comment, suggestion and/or observation about the design of sanitary towel bins in public conveniences it would be...

7) If you have a disability, can you please state your disability.

8) Age – (This question is used to validate the cross-section of society asked)

Under 18	18 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 65	Over 65

9) If you practice/follow a religion can you please state which one – (This question is used to validate the cross-section of society asked)

Atheism	Christianity	Judaism	Buddhism	Hinduism	Islam	None
Other:						

10) If you feel you may wish to further contribute to the research please leave your email address

@

Thank you for taking part in the **Toilet-Talk.co.uk** on-street survey.

APPENDIX 3: INTERVIEW QUESTIONS

Question	Check
Question	*Check*
The Toilet	
Availability	
Do you find toilets in public conveniences accessible?	
Privacy Issues	
Do you have any concerns over your privacy when using toilets?	
Do you have and concerns other than visual privacy?	
Product Use	
Do you experience problems from splash back?	
What do you think these problems attributed to?	
What do you think about toilet seats in public conveniences?	
How do you use the toilet?	
Perceptions and Expectations	
What is it for you that makes for a positive toileting experience?	
What is it for you that makes for a negative toileting experience?	
Hygiene	
What for you creates a sense of hygiene?	
What do you think about the cleanliness of the toilets?	
Do you have any concerns over using public conveniences?	
Usability	
How easy is it for you to use a toilet in a cubicle?	
What are you likely to have with you?	
What are you likely to be wearing?	
What would you say guide your toileting habits?	
Emotional Effect	
How would you describe your average experiences of using toilets in public conveniences?	
How would you describe how using toilets in public conveniences makes you feel?	
User requirements	
What is the most important requirement from a toilet?	
The Urinal	
Product Use	
Does splash back concern you and if so why?	

Do you have any other concerns about using urinals?	
Product Preference	
Which design of urinal would you prefer?	
Which design of urinal would you least like?	
Given the choice would you opt to use a urinal or a toilet for urination?	
Privacy Issues	
Does it concern you to have other people present when you use a urinal?	
Do you feel you have any other privacy issues?	
User requirements	
What is the most important requirement from a urinal?	
Sanitary Waste Bins	
Product Use	
What factors influence your usability of the sanitary waste bin?	
What features would you like on a sanitary waste bin?	
Does the sanitary waste bin affect any of your actions when in the cubicle even when its use is not required?	
Emotional Effect	
What are your views on sanitary waste bins?	
User requirements	
What is the most important requirement from a sanitary waste bin?	

APPENDIX 4: PRE-LETTER EMAIL

Dear [*ENTER PARTICIPANTS NAME IF KNOWN*],

Firstly, I would like to thank you for taking part in some previous research of mine. Over the last year I have been collecting information on how the UK public view current LA provided public conveniences. You took part in one of my surveys and submitted your email address expressing an interest in future research. I have now had two successful publications due to the information gathered and I am very pleased with the progress, again thank you.

I am writing to invite you to take part in a further study, I am hoping to interview people to gather information previously unobtainable through questionnaires.

The interview should last an hour to an hour and a half and will be happening over the next few weeks. It has been designed to be an interesting and relaxed involving talking, writing and possibly a bit of drawing (do not worry, if you feel you cannot draw; I will do my best to draw for you!).

If you would like to take part please could you reply to this email with your address and phone number (this information will only be used by me to contact you and will not be given to any third parties) so as we can make mutually convenient travel arrangements.

I hope you will be able take part and to hear from you soon, your views and experiences are vital to the research.

Best wishes
Elaine Williams

APPENDIX 5: WORD CARDS

ACCESSIBILITY

AGE

ALTERNATIVE FACILITIES

CLENLINESS AND HYGIENE

CLOTHING

DEFECATION

DESIGN

EXTRAS

FLUSH

GENDER

MAINTENENCE

MATERIALS

MENSTURATION

OTHER USERS

PHOBIAS

PRIVACY

RLIGION AND CULUTURE
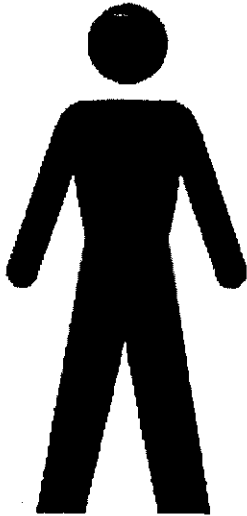
SANITARY WASTE BIN
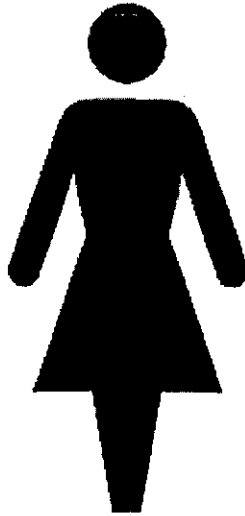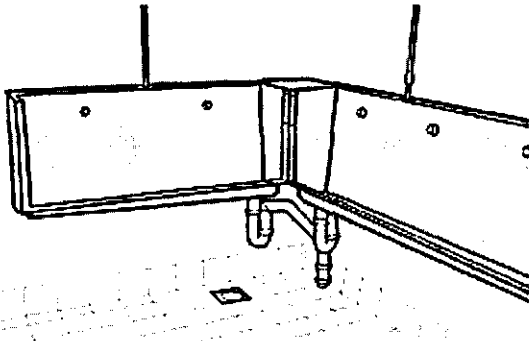
SPACE

TOILET

URINAL

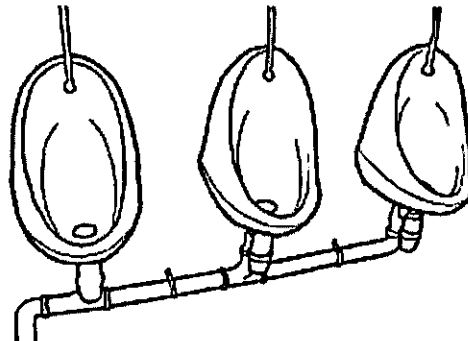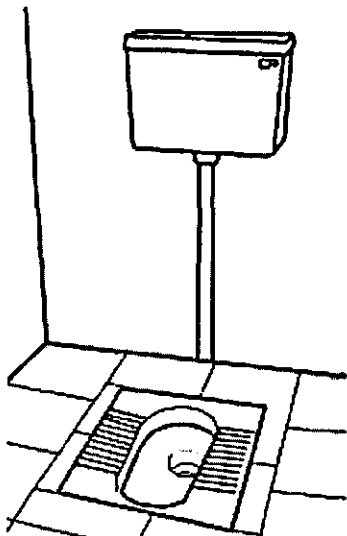URINATION

USABILITY

USERS

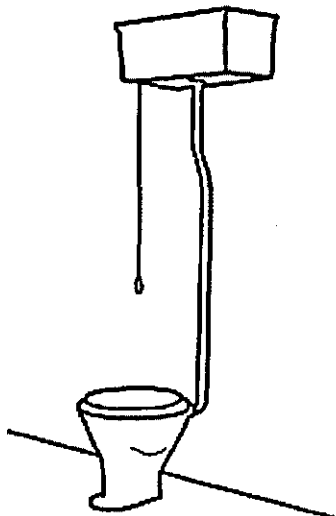VANDALISM

Male Sign

Female Sign
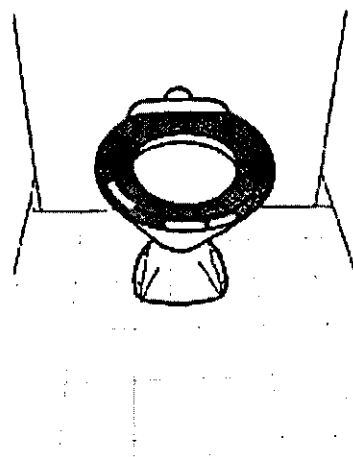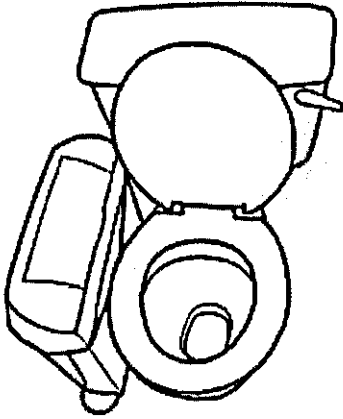
Accessible Sign
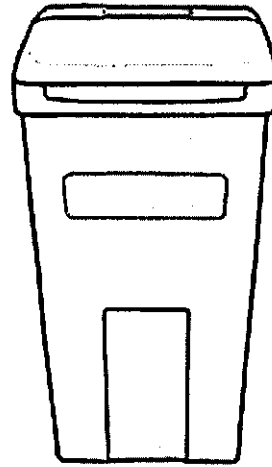
Trough Urinals

Ceramic Urinals

Squat Toilet

Toilet with Pull Chain

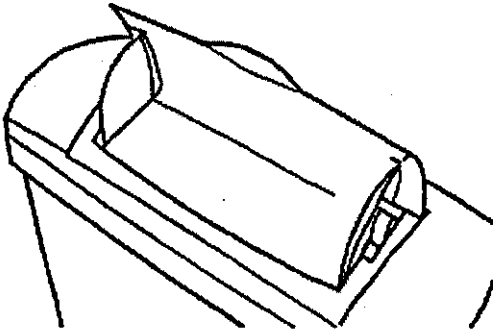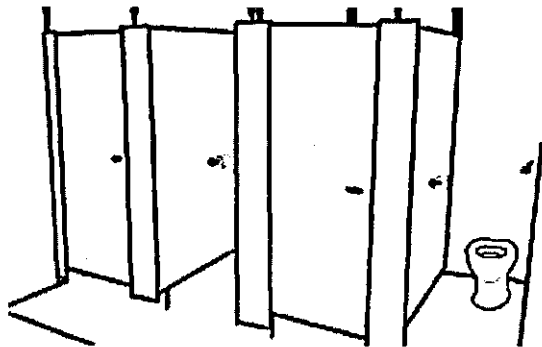Stainless Steel Toilet

Toilet with Sanitary Waste Unit

Sanitary Waste Unit

Sanitary Waste Unit Open

Cubicles for Toilets

APPENDIX 7: INTERVIEW SAMPLE WITH CODING AND CLUSTERING

Interview Sample from Female Participant (F42)

    Bold = Interviewer

    Normal = Participant

Interview	Code	Meaning of code
Ok, and how do you use the toilet? ... Do you sit on it? I sit yeah **Sit** Yeah	Toi-int-st-sit	Sitting on a sit type toilet
And do you find that you have enough room to sit? It will depend on thing like, how big first the cubicle is, because sometimes they can be quite tiny, but usually that's ok, but usually its things like the sanitary bin	Cub-int-space	Space provided by cubicle and its affect on product usability
and where the toilet roll holder is because you can be banging your elbows on everything. **Ok.**	Pc-emo-Other	Other products external to the sanitary items
You mentioned about the gaps and the bags. Do you have concerns about privacy, or any other sort of concerns that are to do with the physical surroundings of the toilet? I suppose the only thing I'm concerned with privacy is in depending upon the state of the toilets, whether things like the doors lock .	Cub-lock-pos	Positive to have a lock on cubicle door
Usually I don't worry in terms of privacy with the walls, where there's a gap at the top or the bottom, it's not normally a privacy issue	Toi-emo-priv-uncon	Unconcerned about privacy at toilets
but it could be a security issue. **Ok**	Toi-emo-sec	Security at toilets

Do you have any other privacy issues? ... **So you don't have any visual privacy issues?** No **No** No	Toi-emo-priv	Privacy issues general toilets
I did not ask about how easy it is for you use to use the toilet when you have your son with you. I presume you go in there to probably help him? Yes he'll go first and then we'll swap over	Toi-inf-age	Changes noticed with age
but it depends on the size of the cubicle and everything in there that were can literally manoeuvre around each other. I can say I've never had a major problem, but some are better than others	Pc-emo-space	Influenced by space around the products
Have you ever come across the family rooms? Not just as a toilet no. **No** No **No.**	Cub-fam-neg	Not come across family rooms
Ok, this is from one of the finings of the previous bit of research to do with splash back, which is anything that can cause water to come, or liquid to come, out of the toilet. Do you ever experience problems from that? Not when using the toilet, but you can quite often go in and find seats are wet and you don't know then where the water has come from.	Toi-int-seat-sb	Seat is found covered in splash back
And you do you have any ideas what that could be? I'm assuming it's usually the flush, and that the flush is too powerful or something like that.	Toi-int-sb-flush	Splash back cause by the flush

How does it make you feel? Horrible **Horrible**	Toi-int-sb-neg	Negative about splash back
Horrible, if say the toilet seat is obviously damp, or sometimes it's literally puddles in front of the toilet on the floor , then I may well go and look in the next door one.	Cub-int-floor	Users interaction with the floor
That was my next question would it affect your toilet use? Yes I would go look at another one and see if it's better.	Cub-cho-neg	Negative cubicle choice
So you mentioned puddles on the floor and water on the seat. What are your views on toilet seats in public conveniences because you said you sit on them? Yeah, I try not to get too worked up about them **Yeah**	Toi-int-seat-neg	Negative about seat design
Because I think I'd just stop using them if I thought too much.	Toi-int-sb-neg	Negative about splash back
It's great if you find those little dispensers, I don't think I've ever used a dispenser that gives you a cover to put on the seat, but if there's any that's have got any wipes in or anything like that.	Toi-emo-seat-cov-pos	Positive emotional reaction towards seat covers
I will think that's a really nice idea. Sometimes it's literally a case of having to sort of wipe seats down before you use them, which could really put me off and certainly if I've got my son with me it would.	Toi-int-seat-wipe	Wipes seat before using toilet

APPENDIX 8: PARTICIPANTS' BACKGROUNDS

Code	Religion	Disability	Background Information	Employment
F24	None	N/A	Mother catholic father Muslim	Marketing Manager
F29	None	General spinal problems	Mother is a biologist	Researcher
F31	None		Portuguese	Researcher
F38	None	urinary tract infection	Is a mother	Researcher
F42	Christian	N/A	Is a mother	Careers Advisor
F79	Christian	Ulcerative Colitis	Is a mother	Retired Secretary
M26	None			Customs Officer
M41	Christian	Avoidant Paruresis	Is a Father Carers for disabled father	Research Consultant
M47	None	N/A		VAT inspector
M56	None	N/A	Is a father	Fraud Investigator
M60	Christian	slightly arthritic	Is a Father	Consultant Ex Teacher
M80	Christian	Use of walking sticks Diabetes, Angina Obesity, Arthritis	Is a Father	Retired Engineer Ex Army

APPENDIX 9: BREAK DOWN OF TOILET USAGE

Part No	Event	Condition		Action	Wiping	Flushing	Seats
F24	Urination mainly. Defecation only if no alternative available	Drunk	Puts toilet paper in to prevent splash back	Sit			
		Sober	Does not like to see the effects of splash back	Hover			
F29	Urination, Defecation and Menstruation	Does not like to see the effects of splash back		Sit		Puts seat down to avoid spread of germs from flush. This was influenced by a TV program	
				Hover			Would want an automatic lid to come down before flushing
F31	Urination and Defecation	Squats with feet on top of seat.	Puts toilet paper in to prevent splash back and scarring

Does not like to see the effects of splash back

Never experiences | Squats | | Likes to be able to flush when defecating | Seats should not exist in public conveniences (F31_0042) Seat covers and would help her overcome needing to sit on a surface that had already been sat on (F31_0049)] |

		problems with splash back Thinks infections can be caught from toilet seats				Puts toilet paper all around before sitting (F31_0049)
F38	Urination only No defecation due to lack of privacy	Medical condition is lessened if she sits due to fuller emptying of the bladder. Always wipes the seat prior to use due to concerns about splash back.	Sit Will not hover		Turn and flush at end	
F42	Urination and Defecation	Does not like to see the effects of splash back	Sit		Turn and flush at end	
F79	Urination and Defecation	Medical condition Never experiences problems with splash back	Sit		Turn and flush at end	Mother advised to use toilet paper pre sitting down (F79_0051)
M26	Urination and Defecation		Sit			
	Urination		Stand			
M41	Urination and Defecation		Sit			Happy to use loo with no seat (M79_0027)
			Hover			
M47	Urination Will not defecate	Due to hygiene concerns he will not sit.	Stand			

M56	Urination		Stand		
	Defecation	Does not find it easy	Hover		
M60	Urination	Aims at inside side of the bowl to reduce splash back	Stand		(M60_0145) likes lids but happy to use loo without seat.
	Urination and Defecation		Hover		
M80	Urination and Defecation		Sit	Remains seated and leans over	
	Urination	Lifts seat	Stand		
Son of F42	Defecation		Sit		

APPENDIX 10: MATERIAL AND COLOUR CHOICE

Part No	Condition	Material Positive	Material Negative	material Undeceive	Colour
F24		Ceramic			White
	Looks like a bucket		Stainless Steel		
F29	Same as at home	Ceramic			White sparkling cost (would notice a pink toilet)
	reminded her of school "purely perfunctory"			Stainless Steel	
	surgical and clean	Stainless Steel			
F31	Personal Preference and easier to clean	Ceramic			
	Good for public use	Stainless steel			
	Spreads Sound		Stainless Steel		
F38		Ceramic			White looks smarter
	Utilitarian		Stainless Steel		
F42	Looks less public than Stainless Steel	Ceramic			White it looks more hygienic
	Not as attractive		Stainless Steel		
F79		ceramic			White
M26	Best at avoiding splash back	Ceramic			

	Poorer standard		Stainless Steel,		
M41					
M47		Ceramic			
M56		Ceramic			
M60					No preference
M80					
Son of F42					

APPENDIX 11: DESIGNER QUESTIONAIRE

Interview No:	
Name:	
Company:	
Position:	
Job description:	

Appearance and Content

How did the pamphlet look to you?

Did you like the colours used?

Yes ☐

No ☐

Was the text readable?

Yes ☐

No ☐

Was the language at an acceptable level?

Yes ☐

No ☐

Did you feel the information was relevant to the task set?

Yes ☐

No ☐

Think about the presentation/layout of the information in the pamphlet, how would you rate this?

Awful	Bad	Okay	Good	Very Good

Explain answer:

How useful was the information in the pamphlet in term of aiding/guiding your design?

Not Any Use	Not Really Relevant	Did Not Use It	Helped A Bit	Helped A Lot

Explain answer:

Using the pamphlet

What was your initial reaction to the pamphlet before you started your designing?

Useless	Not Much Use	Some Use	Useful	Very Useful

Did you use the pamphlet before you started designing?

Yes [ ]

No [ ]

What was your reaction to the pamphlet when you were designing?

Useless	Not Much Use	Some Use	Useful	Very Useful

Did you use the pamphlet during designing?

Yes [ ]

No [ ]

How did you use the pamphlet?

Did you refer back to pages 1 – 4, "the need for convenience" to "encourage use, reduce misuse" and/or the back cover?

Yes [ ]

No [ ]

Did you refer to the 'mix & match' pages?

Yes [ ]

No [ ]

Was the option of having the 'mix & match' useful in the design process?

Yes [ ]

No [ ]

Explain answer:

Which page was the most useful to you in the project?

	Front cover		Encourage use, reduce misuse (page 4)
	The need for convenience (page 1)		Mix & match (pages 5 – 10)
	Know your users abilities (page 2)		Back cover
	Product use process (page 3)		

Designing

Did the pamphlet help with your designing?

Yes ☐

No ☐

Did the pamphlet guide your concept design?

Yes ☐

No ☐

Do you feel the guide had an influence on the final design outcomes?

Yes ☐

No ☐

Explain answer:

☐

Do you feel the guide had a positive or negative influence on your design?

Positive ☐

Negative ☐

Do you think that you would have come to the same design conclusion without the guide?

Yes ☐

No ☐

Did you notice that the words "toilet, urinal and sanitary waste unit" had not been used apart from on the page titled "encourage use, reduce misuse"?

Yes ☐

No ☐

Did this affect the design?

Yes ☐

No ☐

Usefulness

Would you use this type of guide to design products for this market?

Yes ☐

No ☐

Explain answer:

☐

As a practicing product designer/design student did you enjoy using this guide?

Yes [ ]

No [ ]

Would you use this guide again if you were to repeat the project?

Yes [ ]

No [ ]

What changes would you make?

[ ]

What are your thoughts in relation to the pamphlet now you have completed the design project?

[ ]

APPENDIX 12: LETTER TO DESIGNERS

Thank you for agreeing to take part in this user study. The aim of this study is to test the guidelines that have been created for the design of able-bodied multiuser sanitaryware in the UK.

The research has identified three elimination tasks of users; defecation, urination and menstruation. You are asked, in this study, to design a solution or solutions for the elimination tasks of the users, you have been provided a pamphlet, which you are asked to look at and uses as you see fit for the completion of the task.

The pamphlet comprises of two sections, one manly of text and diagrams and the other is the "mix & match" section. The "mix and match" section works by folding the pages (top and bottom) to create different scenarios.

Please keep your sketch sheets so I may look at them when we have a short follow up interview in about 7 days time. All the intellectual property will remain yours and all original sketch work will be returned to you at the end of the study. No reproduction of the sketches will be included in the thesis without prior consent.

Best wishes

Elaine Williams