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User Satisfaction with Personalised Internet Applications

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The study focuses on user satisfaction with websites and personalised internet applications in particular. The abundance of information on the web is increasing more and more. Therefore, the significance of websites targeting the users' preferences, like personalised internet applications, is rising. The aim of this study was to find out which factors determine user satisfaction with personalised internet applications. Factors like the usefulness of the information or trust towards how personal information is handled were considered. A large-scale user survey evaluating three internet applications (from the travel, e-learning and real estate domains) was conducted. Expert opinions were collected to complement the results and provide insights from users' and experts' points of views.

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1 INTRODUCTION

The WWW changed from a purely information retrieval function towards a place where customers are increasingly buying products and services. The figures estimated for the US growth in online purchases during the time period 2004 to 2008 amount to 18.5%. For some European countries like the UK, Germany, France, Italy and Spain the estimation of growth is even much higher with 41% for the same time period 2004-2008 (eMarketer, 2005).

On the one hand, people use the Internet more and more for purchasing goods. On the other hand, there is an overwhelming amount of information about products and services constituting the need for improved functions to help internet users being efficient. Personalised systems and recommender systems offer the useful functionality to provide search results and proposals tailored to the individual preferences and constraints of the user. Personalisation (or customisation) is defined as a technique proposing individualised content for each customer (Greer & Murtaza, 2003). Personalised and recommender systems filter out relevant items for a customer according to his or her previously stated preferences and needs (Thompson, Göker, & Langley, 2004).

Compared to stand-alone web sites those kind of online systems offer the advantage for the customer to reduce search costs (Lynch & Ariely, 2000). Furthermore, personalised systems help to decrease information overload and to increase user loyalty (Perugini, Gonçalves, & Fox, 2004).

1.1 Problem statement

Research investigating Human-Computer Interaction (HCI) concepts applied to personalised systems and recommenders is very limited disregarding the fact that the significance of those systems increases more and more. Additionally, new factors, like trust emerge, whose significance was not that high in the past. Purchase activities require websites which provide the user with a feeling of security if required to give away personal and sensitive data like credit card information. The influence of trust was considered in various studies, e.g. Koufaris and Hampton-Sosa (2004), Gefen and Straub (2004). Their findings suggest that trust has a significant impact on online purchase intentions.

Another important development is that people are more and more experienced when using the Internet. Rising internet experience leads to higher expectations and satiation effects. Not only utilitarian but also hedonic benefits are sought. It is not enough anymore to have a website offering necessary information which can be easily found. Satiation effects require additional appeals, e.g. fun during the purchasing process. Purchasing and browsing activities on the Internet should fulfil a kind of entertainment function as well. There are already a number of studies investigating the effect of fun, enjoyment, playfulness or pleasurefulness. Yi and Hwang (2003) highlighted the importance of enjoyment as antecedent of usefulness, ease of use and self-efficacy. Van der Heijden (2003) added the construct perceived enjoyment to ease of use and usefulness (which are the two factors of the Technology Acceptance Model (TAM)). Chung and Tan (2004) investigated the antecedents of perceived playfulness which are among others, speed, content, variety, focused attention. Teo, Lim et al. (1999) found out that most importantly, the Internet is regarded useful for task fulfilment and second, there is surprisingly already enjoyment together with ease of use.

Technical and skill barriers did have a significant influence on the use of and on the satisfaction with the Internet. However, these influencing factors are diminishing more and more; technical and skill barriers are less and less inhibitors to use the Internet for purchase activities. Bandwidth is constantly being improved. More and more people have access to the Internet and therefore become more skilled. Together, these factors contribute to a rapid change in the Internet "environment". Thus, the goal of this study is to combine those changing and emerging factors in a common model for explaining satisfaction with personalised internet applications.

This study distinguishes from already existing ones by the following aspects: First, the focus will not be on the measurement of general WWW satisfaction and its influencing factors. Instead, three particular personalised internet applications are investigated. The satisfaction is measured directly after the users have experienced the system and have finished a predetermined task simulating real problem solving and purchasing activities. When measuring such emotional constructs like exploratory browsing or enjoyment it is crucial to conduct an evaluation immediately after the experience with a particular web site has taken place because memories are fading. An explanatory model for the satisfaction with personalised internet applications was proposed, elaborated and tested in the course of this study. Furthermore, the influencing factors trust and exploratory

browsing behaviour were added in the satisfaction model additionally to ease of use and usefulness.

1.2 Objectives of the study

The predominant goal pursued with this study is to develop a comprehensive model which is appropriate to evaluate satisfaction with personalised internet applications. What are the main factors driving satisfaction which in turn influences commitment (the intention to revisit the web site or to recommend it to others)?

Furthermore, the study has several sub goals. First, literature is reviewed to identify similar studies and relevant approaches from other web site studies, information systems (IS) and Human-Computer Interaction (HCI) studies. The main objective of this step is to identify possible influencing factors. Second, a research model is proposed based on those influencing factors. For each of the model dimensions measurement items are developed either by literature review or in an exploratory manner (by proposing new items and pre-testing them). Third, the research model is tested among users (test persons) involving three different personalised internet applications stemming from different areas. The reason for that is the objective to develop a model covering influencing factors for a wider range of personalised internet applications. The survey will be Internet based because test persons are asked to experience the web site before evaluating it. A major concern is that a certain kind of involvement is created by proposing them to accomplish a pre-determined task and to reduce extraneous variance. The goal was to collect a rather large sample size of more than 1000 test persons to be able to analyse the survey data with structural equation modelling, to employ multiple group analysis and to discover differences among the personalised internet applications.

1.3 Structure of the book

This study aims to investigate the influencing factors on satisfaction with personalised internet applications. The book consists of six chapters starting with the introduction. The theoretical background relevant to this study is described next. The research model, the study methodology and the results are presented in

the following chapters. Finally, the conclusion drawn from this study as well as implications for practitioners and future research are outlined.

The theoretical background chapter starts with a classification of personalised internet applications. What is the difference to ordinary web sites or more sophisticated systems like recommenders? Research traditions and theories relevant to this study are reviewed with the goal to consider theories which might be useful but are not obviously helpful at first glance, e.g. domestication research. Next, the concept of customer satisfaction in general is investigated. The following sub-chapter "Human-Computer Interaction" consists of a review of relevant approaches to explain satisfaction (or usage, acceptance), e.g. the well-known Technology Acceptance Model (TAM) or the concept of Flow. Finally, user interface design aspects and system evaluation methods are discussed.

In chapter three the conceptual model is developed which is the main focus of the study. Each of the dimensions hypothesised to have an influence on satisfaction with personalised internet applications is outlined.

Chapter four presents the study methodology used to identify the degree of influence each of the hypothesised factors has on satisfaction with personalised internet applications. The operationalisation of the respective constructs is described and how the survey instrument was developed. The internet applications used to validate the model are briefly delineated. Finally, the approach how study participants were encouraged to participate in the user survey is outlined.

Chapter five focuses on the results starting with the descriptive analyses and moving on to structural equation modelling. First, an overview of the demographic distribution of the sample is given. Second, the study participants are classified according to personal characteristics such as attitude towards online information search or internet familiarity. Finally, the participating personalised internet applications are compared in terms of the results they achieved when study participants evaluated them. The structural equation modelling part of the dissertation covers general issues such as model fit and the distinction between measurement and structural model. Next, results for an overall structural model as well as for multiple group analyses are presented. The final part of chapter five deals with results of expert interviews conducted to give additional insights and an outlook for future possible developments.

The final chapter six provides a conclusion of the main results and a discussion of the findings. Limitations of the study are outlined and implications for future research as well as for practitioners are given.

2 STATE OF THE FIELD – THEORETICAL BACKGROUND

This chapter starts from the most general topics which do play a role for this study and is narrowed down to the more specific issues. First, some definition and classification for personalised internet applications is introduced. Research traditions relevant to the field of usability, the adoption of and satisfaction with information systems are reviewed. Section 2.3 includes an overview of general theories about customer satisfaction. Next, theories about human computer interaction (HCI) are meta-analysed and the most prominent models (i.e. the TAM, contributions to Flow) are explained in greater detail. In Section 2.5 user interface design approaches will be discussed. The goal is to give a brief overview which design approaches exist to provide effective website design. Another relevant area for this study is usability testing and system evaluation, which will be dealt with in the final section of this chapter.

This chapter intends to give a quite widespread outline about existing theories relevant to the topic of personalised system and recommender evaluation.

The goals are:

⇨ to give a classification of personalised internet applications (PIA) on which is the focus of this research but also to give a definition of related systems such as recommenders,

⇨ to identify relevant research traditions of different disciplines and theories coming from satisfaction research,

⇨ to avoid missing important and relevant contributions, and

⇨ to adapt models or borrow concepts from other disciplines to the HCI and system evaluation topic.

2.1 Classification of Personalised Internet Applications

Personalised internet applications are the focus of this study. Therefore, this section is intended to give a classification and definition of personalisation and related terms such as adaptation, customisation, individualisation and

recommendation. Furthermore, decision support systems (DSS) which can be seen as ancestors of personalised systems will be outlined as well.

According to Wright (2002) there are two types of personalisation. The first one allows the user to adapt the Graphical User Interface (GUI) to his or her own preferences. The second is concerned with the content of the system. The content is customised to the individual personal preferences of the user. Perugini and Ramakrishnan (2002) defined personalisation as the automatic adaptation of information content, structure or presentation to the preferences of the individual user. Similarly, Blom (2002) and Perugini & Ramakrishnan (2002) classified personalisation as a process that increases individual relevance by changing the content, structure, functionality, presentation (interface) or distinctiveness of a system. Adomavicius and Tuzhilin (2005a) named as examples of possible personalisation strategies: personalised content (pages or links), product and service recommendations or personalised information services.

What is the major goal and motivation to develop and use personalised internet applications? First of all, the amount of information provided on the Internet is uncountable. Often, consumers are lost in the plethora of the Internet. Therefore, efficient information search is simply a necessity. Search engines are one way to overcome these problems. However, they do not present the information in a personalised or customised way. Further support tools are needed to satisfy this need. Recommender or personalised systems are appropriate tools to present individualised information (Wei, Moreau, & Jennings, 2003). Moreover, there is a rising diversity of user needs (Lekakos & Giaglis, 2005). Thus, a personalised web site becomes more responsive to the unique and individual user's needs and preferences (Cingil, Dogac, & Azgin, 2000). The process of personalisation can be either system or user initiated (Blom, 2000, 2002). Kumar (2005) gave an overview of different personalisation techniques (see Figure 1).

The collection of user information can be done either implicitly or explicitly. While explicit profiling collects information or preferences of the user by directly asking him / her (e.g. to give some product ratings), implicit data collection tracks the user behaviour (Kumar, 2005). As far as the personalisation techniques are concerned there are several techniques. Simple filtering applies clustering of users. Members of similar groups get similar proposals (Kumar, 2005). Content based filtering (also called feature based filtering) methods personalise according to the attributes of a product or service which fit best to the current or past user's preferences (Adomavicius & Tuzhilin, 2005a; Wright, 2002). Personalisation is therefore based on the attributes of the item

(Adomavicius & Tuzhilin, 2005a; Runte, 2000; Wright, 2002). Adomavicius and Tuzhilin (2002) proposed an infomediary (a service that provides specialised information) called e-Butler. E-Butler enables personalised online shopping and takes preferences of the respective user into account and relates them to the attributes and characteristics of the products.

Collection of User Information		Personalisation Process - Filtering Techniques
		Simple Filtering
Implicit Profiling		Content Based Filtering
		Collaborative Filtering
Explicit Profiling		Case Based Reasoning
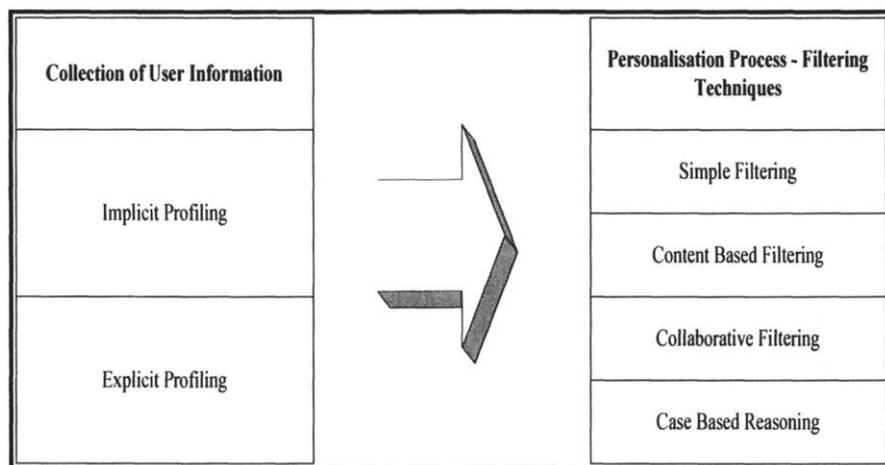
Figure 1. Personalisation Techniques
(adapted from Kumar, 2005)

The more advanced techniques to provide personalised and recommendation services consist of three major categories: Collaborative Filtering (CF), Case Based Reasoning (CBR) or hybrid approaches (Adomavicius & Tuzhilin, 2005b). Collaborative Filtering is considered to be the most successful recommendation or personalisation technique (Cho, Kim, & Kim, 2002; Ha, 2002). CF is defined as a technique using the behaviour of others when giving recommendations; it mimics word-of-mouth recommendations (Ansari, Essegaier, & Kohli, 2000; Pemberton, Rodden, & Procter, 2000). Recommendations are derived by the ratings of other similar users and of ratings in the past. Amazon is a very popular example using this technique. Case-Based Reasoning can be compared to human memory; previously experienced cases (concrete problem situations) are reused to solve new, similar cases. Furthermore, those

cases are retained and the system is learning by each new problem (Aamodt & Plaza, 1994).

However, personalisation and recommendation methods are a well researched area applying also novel approaches, e.g. natural language processing (Berger, Dittenbach, & Merkl, 2004) or adaptive neural networks (Wallace, Maglongiannis, Karpouzis, Korzmentas, & Kollias, 2004). Often hybrid approaches are used by combining two of the above mentioned technologies, e.g. a content based approach together with collaborative filtering (Wright, 2002).

The terms adaptive, individualised or customised systems are used frequently as well. Therefore, some clarification will be made if these terms can be used synonymously to personalisation or if they have different meanings. Literature review shows that when considering adaptive systems they are often mentioned together with personalised systems (e.g. Liu, Wong, & Hui, 2003; Perkowitz & Etzioni, 2000). Systems using automatic personalisation have also been called "self-customising software" (Hirsh, Basu, & Davison, 2000). According to Ansari and Mela (2003), e-customisation is the process of adapting the content automatically for individual users. Finally, individualised content is often referred to as a technique for personalisation (Greer & Murtaza, 2003).

When speaking of personalised systems often the term recommendation system (also called simply recommender, advisory system or counselling system) comes up. Recommending items is often included when a personalisation process is performed because it helps to tailor the web site to the preferences and wishes of the user (Ha, 2002). Lekakos and Giaglis (2005) argue that recommenders are a special type of personalised systems. Groß and Sadeghi (2001) gave a general definition of recommenders proposing that such systems like chat rooms or forums offer advice from like-minded people. Applied to the context of e-commerce it is a relationship between a client and a server. The benefits of the latter would be for the e-commerce supplier or provider the increased probability to turn browsers into buyers, to enable cross-selling and finally, to enhance loyalty. The advantages for the user of such systems would be to get better results by being provided with product ratings and by having greater potential knowledge because of other users. The limitation to overcome is to guarantee a certain level of privacy (although it is rather difficult to get the right balance between personalisation and privacy).

According to Stohr and Viswanathan (1999) recommendation systems are a sub-category of decision support systems helping us to deal with the information overflow which leads to the next relevant group of systems: decision support

systems. Research on decision support systems has already been conducted for a considerable amount of time having its origins in investigating management decision support systems and marketing decision support systems (MDSS), e.g. Wöber and Gretzel (2000). Furthermore, marketing and management support systems (e.g. Wierenga & van Bruggen 2000) or management information systems (MIS) are found as well in that context. O'Keefe and McEachern (1998) argued in their contribution about Web-based customer decision support systems (CDSS) that a consumer decision process can be split into five steps (see Figure 2).
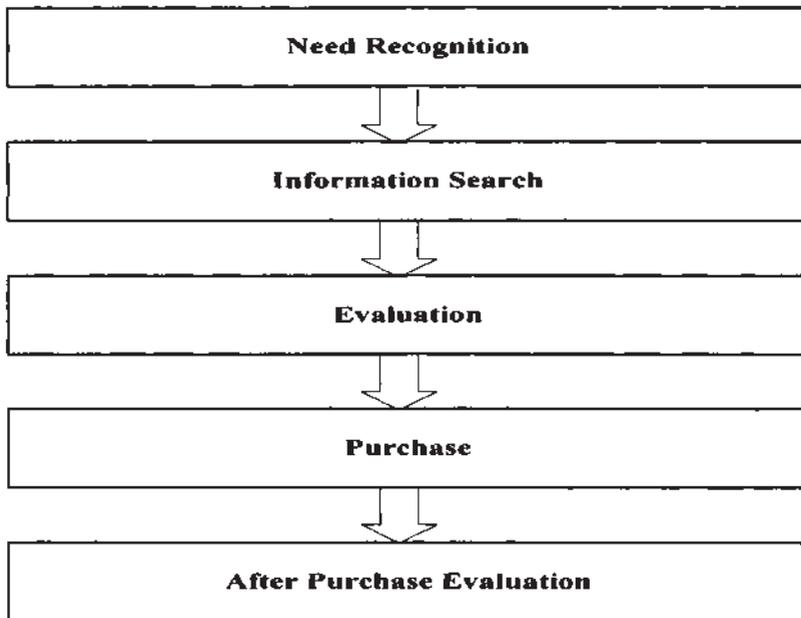
Figure 2. The Consumer Decision Making Process
(O'Keefe & McEachern, 1998)

When considering which steps of the consumer decision making process are relevant to personalised systems, it is obvious that a personalised system should help in information search, evaluation and probably in the purchase phase (by providing appropriate ordering forms and payment systems) as well. Additionally, after purchase evaluation is provided by some personalised systems

by offering rating tools for customers having already experienced the product or service. Finally, need recognition could also be pursued by offering personalised systems. The system can suggest products or services of which the user was not aware before but corresponds to his/her tastes and preferences.

2.2 Relevant Research Traditions and Theories

Various disciplines are of importance for this field of research: psychology, business (marketing and consumer behaviour), mass communication with uses and gratification research, adoption studies in information systems research and finally sociology contributing with domestication research.

Psychology comes first to one's mind when thinking about (user) behaviour. Especially social psychology plays a crucial role when searching for a theoretical foundation for behaviour. The theory of planned behaviour (TPB, Ajzen 1991) which originates from the Theory of Reasoned Action, TRA (Fishbein & Ajzen, 1975), is a well-known example often used in consumer behaviour research and serving as basis to develop user behaviour models (e.g. the TAM). Social Cognitive Theory (SCT) or Social Learning Theory (SLT) is a further relevant theory for this study. SCT is widely accepted for explaining behaviour, e.g. by incorporating the factor self-efficacy in a research model (Chan & Lu, 2004). The domain of cognitive absorption (e.g. Agarwal and Karahanna, 2000) and the notion of Flow (originally introduced by Csikszentmihalyi (1975) and adopted by Hoffman and Novak (1996) to the web context) play an important role as well. The hygiene and motivation theory originally published by Herzberg et al., (1967) was adapted by Zhang and Dran (2000) for website design and evaluation. The main assertion is that there are some basic factors or criteria (i.e. prerequisites) which have to be met otherwise dissatisfaction is caused. The latter, motivation factors, don't have to be met necessarily but if they are fulfilled they are likely to produce satisfaction. The motivational model (MM), with the core constructs of extrinsic and intrinsic motivation is well studied in different areas e.g. human resource management and is used to explain online behaviour as well (e.g. Shang et al., 2005).

Diffusion research is another relevant discipline applied in marketing or consumer research but also in sociology, education or anthropology. The focus is on the adoption and diffusion of innovations. Innovation diffusion theory (IDT) was proposed by Rogers (1976; 1995) and was defined as "the process by which innovation is communicated through certain channels among the members of a

social system". IDT is often used as a basis in studies about new information technology. Thus, the relevance for the Internet is obvious. While obtaining information via the WWW is quite common nowadays, buying products and services online is still not that widespread. Diffusion of innovation theories serve as a basis to explore online buyer behaviour in general (e.g. Chen, Lee et al. 2004) or to investigate specific applications such as buying cars online (Molesworth & Suortti, 2001). IDT is applied in the m-commerce environment as well (e.g. Kauffman and Techatassanasoontorn 2005; Wu and Wang 2005).

Uses and gratifications research stemming from the area of mass communication have relevance for the Internet as well. Models of consumer motivations for media usage are provided including Internet usage. Katerattanakul (2002) suggests that consumers are looking for three main gratifications when using the Web: information search, consumer transactions and enjoyment. Eighmey and McCord (1998) concluded that in order for a computer-mediated form of communication to be chosen the first time, it needs to be entertaining and to offer exploration.

Obviously, in information systems research many contributions can be found about website adoption or satisfaction. Various journals are targeted at this research tradition: MIS Quarterly, Decision Support Systems, International Journal of Human-Computer Studies, Information Systems Research, to name but a few. Adoption research deals with all kinds of applications, e.g. automated teller machines (Dos Santos & Peffers, 1998) or computers (Venkatesh & Brown, 2001). A lot of lessons can be learned from research about the adoption of management information systems (MIS) and the adoption of decision support systems (DSS) or executive information systems (EIS).

The final research tradition, domestication research coming from sociology, anthropology or ethnology, studies the process of how a specific good, e.g. a car, a computer or a specific technology becomes part of people's lives (Anderson, 2003; Pedersen & Ling, 2003). Originally, the term "domestication" was applied to the use of quite new products or technologies in home life. Often "domestication" is used in a wider context and means the general use of a specific product or technology (Habib, 2003). Especially in the field of ICTs, a number of domestication studies were realised, e.g. Stewart (2003), Anderson (2003), Habib and Cornford (2001).

Obviously, various research disciplines play an important role when looking for models explaining system usage or satisfaction. Next, customer satisfaction in general will be discussed. Afterwards selected models of human-computer

interaction (HCI) stemming from the above named research traditions are introduced.

2.3 Customer Satisfaction in General

General theories about customer satisfaction and the assessment of services will be discussed to give an overview of what affects customer behaviour. Some of the approaches will be found again in later chapters because they are of relevance to satisfaction with personalised internet applications as well.

Vavra (1997) introduced a model of the satisfaction process depending on expectations, perceived performance, prior experience, ease of evaluating and desires. Prior experience is determined by a lot of antecedent influencers such as demographics, word of mouth, and nature of competition. Expectations are affected by desires and prior experience. Perceived performance is influenced by the ease of evaluating and prior experience. The mediator variable is confirmation / disconfirmation being directly affected by expectations, perceived performance and prior experience. According to Novak, Hoffman et al. (2000), there are a lot of factors influencing behaviour such as involvement, knowledge, emotions, motives, attitudes, values, personality, the type of information acquisition and the kind of processing of information.

Parasuraman et al. (1988) described a model of five dimensions of service quality (SERVQUAL): tangibles, reliability, responsiveness, assurance and empathy. Although the model was originally constructed for the traditional service sector it can be well adapted to computer-mediated environments, tangibles meaning the Graphical User Interface (GUI), reliability can be the error probability of the system itself or the trustworthiness of the information and/or recommendations given. Responsiveness can be related to the fact that a personalised internet application (PIA) should be a highly interactive and conversational one. Assurance is another aspect named by Parasumaran et al., which can be translated into the PIA context to the extent that a system is capable to give appropriate recommendations. Prerequisites to give appropriate proposals are e.g. a large knowledge base and intelligent recommendation functions. Another aspect of assurance is that the system is able to convince the user about the goodness of the suggestions or recommendations. Finally, empathy in the context of recommender systems can be the degree to which the system is able to respond to the wishes and preferences stated by the user.

In 2000, Zeithaml et al. introduced a framework of e-service quality including further dimensions (additionally to the five dimensions named in connection with the SERVQUAL model: access, flexibility, ease of navigation, efficiency, trust (added to assurance), security/privacy, price knowledge, site aesthetics and customization/personalization. Wang and Tang (2003) used the SERVQUAL model as starting point and developed an EC-SERVQUAL model containing four dimensions: reliability, responsiveness, assurance and empathy. Loiacono et al. (2000) proposed a WebQual instrument measuring 12 dimensions divided into 4 umbrella terms: usefulness (dimensions: informational fit-to-task, tailored communications, trust, response time), ease of use (ease of understanding, intuitive operations), entertainment (visual appeal, innovativeness, emotional appeal) and finally, complimentary relationship (consistent image, online completeness, relative advantage). Another WebQual approach was introduced by Barnes and Vidgen (2001). The authors developed their instrument over time and therefore, several variants of WebQual exist. WebQual version 2.0 included 10 dimensions (aesthetics, understanding the individual, communication, access, security, credibility, navigation, competence, responsiveness and reliability). Their latest WebQual version 4.0 (Barnes & Vidgen, 2003) is reduced to a quite parsimonious model of four dimensions: usability, design, information and service.

In 2005 Parasuraman et al. proposed an E-S-QUAL (electronic service quality) scale consisting of four dimensions based on SERVQUAL: efficiency, fulfilment, system availability, and privacy. Additionally, they introduced a second scale called E-RecS-QUAL which is intended to be used when nonroutine incidents happen with the web sites. Three constructs are covered by E-RecS-QUAL (e-recovery service quality scale): responsiveness, compensation and contact (Parasuraman et al., 2005).

Servicescapes is another approach which was originally proposed for service organizations (Bitner, 1992) and later applied to the Web context (Galan & Gonzalez, 2001; Zins, 2002). Servicescapes studies the impact of physical surroundings on consumption settings. Environmental dimensions, i.e. ambient conditions, space/function, signs, symbols and artefacts do have an influence on the holistic environment (the perceived servicescapes), on the internal response of the consumers and the employees and finally, on their behaviour. The Webscape model of Galan and Gonzalez (2001) uses a similar framework but adapted to website design. The environment/"creative palette" (e.g. colours, layout) of a website influences the holistic environment (consisting of four main factors: informational dimension, entertainment, interactivity and effectiveness

dimension). The holistic environment (and the moderating effects) finally influences responses. A different Webscape model was proposed by Zins (2002). In his framework, factors influencing response are classified according to content, control and process characteristics. Content characteristics refer to the type of source, the scope of content, interactivity and vividness. Control characteristics include challenges (time pressure, task complexity), skills and decision style. Finally, process characteristics, i.e. decision rules and decision process have an influence on the response. While the first, servicescapes, measure the influencing factors on consumer and employee responses the Webscape model concentrates on consumer responses.

2.4 Human-Computer Interaction (HCI)

The intention of this chapter is to give an overview of models, theories and concepts explaining user behaviour in computer-mediated environments (CME) and human computer-interaction (HCI). Numerous approaches examining HCI, user acceptance, satisfaction, information systems' (IS) success and their influencing factors, exist. Models and concepts which concentrate on HCI and CME will now be used to review factors which mostly influence the usage of and/or satisfaction with a system. HCI is a well studied topic and a large number of contributions can be found. Theories are meta-analysed and the most prominent models (i.e. the TAM, Flow theory) are explained in greater detail. The goal is to give an overview which approaches provide suggestions to better design or improve a website. Which are the criteria influencing user satisfaction or usage of a system? A prerequisite to design or evaluate information systems is to know about these crucial factors.

The basic goal of the HCI endeavour is to design, construct and evaluate computer-based systems and therefore, enable an efficient and satisfactory use (Hartson, 1998). HCI comprises the design, evaluation and implementation of information systems and their interaction with users (Hewett et al., 1996). The attempts of this discipline are to increase safety, utility, effectiveness, efficiency, accessibility, and usability for users of those interactive systems (Stephanidis, 2001). The question is which are the influencing factors determining computer usage and satisfaction? Therefore, a brief review of existing concepts explaining HCI seems helpful. In the sub-sections following, the most prominent approaches are illustrated in greater detail. An overview of HCI approaches will be given which is by no means an exhaustive list of all contributions.

2.4.1 The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) introduced by Davis (1989) is a widely known and often tested model to explain the acceptance with an information system or web site. Originally, the TAM stems from the theory of planned behaviour (TPB) which in turn was amended from the theory of reasoned action (TRA). The TRA (Fishbein & Ajzen, 1975) and subsequently the TPB (Ajzen, 1991) are theories often applied to explain human behaviour and also HCI. Figure 3 outlines the components of the TRA.
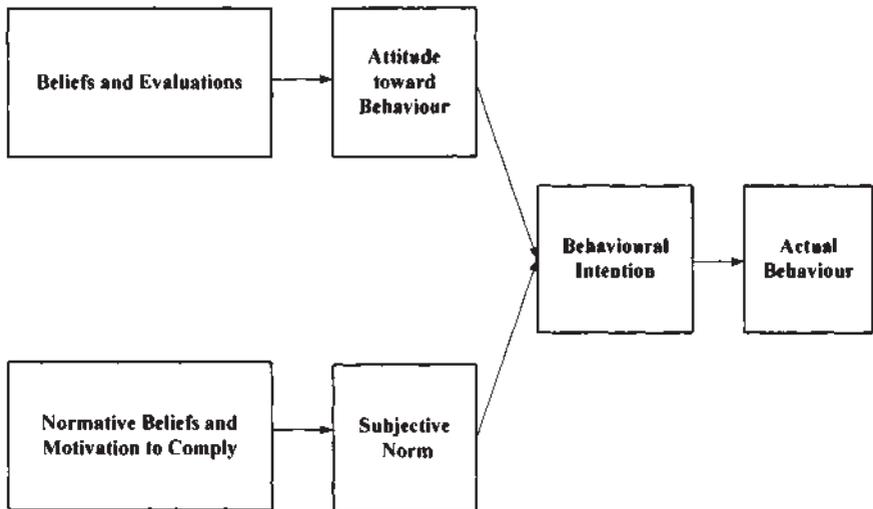
**Figure 3. The Theory of Reasoned Action
(TRA; Fishbein and Ajzen 1975)**

The TRA comes from the discipline of psychology and postulates that behaviour and behavioural intention is influenced by attitude and subjective norm (i.e. social norms). Both of them are in turn determined by beliefs and evaluations as well as by normative beliefs and motivation to comply. Beliefs are defined as a person's subjective probability judgements, how the person sees herself / himself and the environment. Those beliefs will result in some outcomes which will be evaluated (Fishbein & Ajzen, 1975). "Normative beliefs and motivation to comply" deals with the expectations of referent groups or referent

individuals and the person's motivation to fulfil these expectations. Subjective norm describes the behaviour which is performed because of social pressure (Ajzen, 1991). In 1991, Ajzen extended the TRA by perceived behavioural control which is influenced by control beliefs. Additionally, he points out the influences among the respective constructs (see Figure 4).
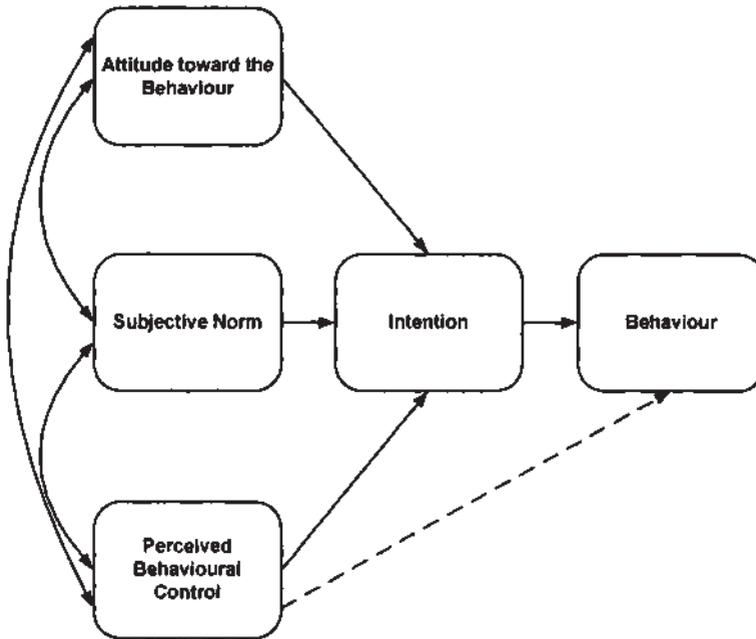
Figure 4. Theory of Planned Behaviour (TPB; Ajzen, 1991)

Perceived behavioural control is defined as the person's perceived ability to perform certain behaviour. This construct is determined by control beliefs which can be defined as supporting or hampering influences to perform that desired behaviour (Ajzen, 1991).

On the basis of the TRA Davis proposed the Technology Acceptance Model (TAM) in 1989. Meanwhile, TAM has become a well-researched and often confirmed model. The TAM relies on two factors explaining human behaviour when using a system: perceived usefulness and perceived ease of use. Perceived

usefulness describes the user's point of view of enhancing his or her performance by using the system. Perceived ease of use is the degree of effort the user believes he or she will need for using a particular system (Davis, Bagozzi et al. 1989). The TAM is shown in Figure 5.
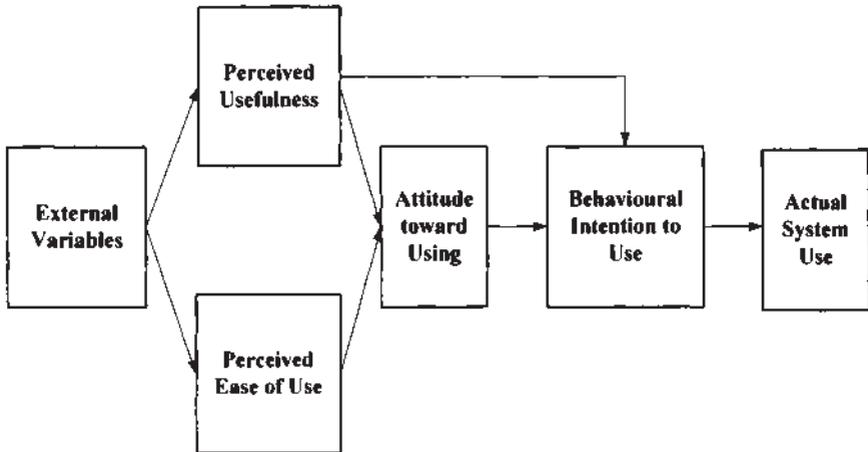
Figure 5. The original Technology Acceptance Model (Davis, 1989)

TAM was supported by several studies, e.g. Lederer et al. (2000) tested the TAM in the WWW context and their results confirmed the TAM. Venkatesh and Davis extended the TAM (and named it TAM2) in 2000 and added subjective norm, image, output quality, result demonstrability and job relevance as further influencing factors. However, Legris et al. (2003), reviewed several TAM contributions and confirmed the model with the explicit constraint that human social change processes have to be included in a broader model. Furthermore, they argued that TAM and TAM2 only explain about 40% of system's use (Legris et al., 2003). Therefore, numerous studies can be found in the literature extending the original TAM model. They add various factors to the previously named perceived usefulness and ease of use. Examples are perceived accessibility and the customer's attitude towards the Web (Jeong & Lambert, 2001), perceived playfulness (Moon & Kim, 2001), application-specific self efficacy (Yi & Hwang, 2003) or trust and perceived risk (Pavlou, 2001). Wöber, Scharl et al. (2002) introduced a framework distinguishing three categories of factors influencing perceived usefulness and perceived ease of use, i.e. personal

factors (expectations and experience), system factors (such as product, speed, intelligence and services) and media factors (speed and operability). Personal and media factors are uncontrollable by the system and the management whereas system factors represent controllable criteria.

Table 1 gives a short overview of selected TAM-related contributions but is by no means exhaustive since there are numerous contributions in this field of research. The table not only indicates different approaches and their author/s but also distinguishes between the independent variables (influencing factors) and the dependent variables (which factor/s is the model explaining, e.g. user satisfaction) for each approach. Table 1 does not always include the antecedents for the independent variables as it is intended to give just an overview and in some studies a lot of antecedents were analysed. This is also true for the subsequent tables in this sub-section.

Table 1. Selected TAM-Related Contributions

Author/s and Publication Year	Article title	Independent (Influencing) Variables	Dependent Variable (Outcome)
Childers, T.L., Carr, C.L., Peck, J. and S. Carson (2001)	Hedonic and Utilitarian Motivations for Online Retail Shopping Behaviour	Usefulness, Ease of Use, Enjoyment	Attitude
Davis, F.D. (1989)	Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology	Perceived Usefulness, Perceived Ease of Use	(Attitude toward Using => Behavioural Intention to Use =>) Actual System Use

Author/s and Publication Year	Article title	Independent (Influencing) Variables	Dependent Variable (Outcome)
Davis, F.D., Bagozzi, R.P. and P.R. Warshaw (1989)	User Acceptance of Computer Technology: A Comparison of Two Theoretical Models	Perceived Usefulness, Perceived Ease of Use	(Attitude toward Using => Behavioural Intention to Use =>) Actual System Use
Jeong, M. and C.U. Lambert (2001)	Adaptation of an Information Quality Framework to Measure Customers' Behavioural Intentions to Use Lodging Web Sites	Perceived Usefulness, Perceived Ease of Use, Perceived Accessibility, Attitudes	Intention to Use Information, Information Use => Recommen-dation
Kucuk and Arslan (2000)	A Cross Cultural Comparison of Consumers' Acceptance of the Web Marketing Facilities	Ease of Use, Usefulness	(Attitude and Intention =>) Acceptance (of Web Marketing Facilities)
Moon, J.-W. and Y.-G. Kim (2001)	Extending the TAM for a World-Wide-Web Context	Perceived Usefulness, Perceived Ease of Use, Perceived Playfulness	(Attitude toward Using => Behavioural Intention to Use =>) Actual Usage
Morosan, C. and M. Jeong (2006)	Understanding Travelers' Adoption of Hotel Reservation Web Sites	Perceived Usefulness, Perceived Ease of Use, Perceived Playfulness	Attitudes => Intentions

Author/s and Publication Year	Article title	Independent (Influencing) Variables	Dependent Variable (Outcome)
Pavlou, P.A. (2001)	Consumer Intentions to Adopt Electronic Commerce – Incorporating Trust and Risk in the TAM	Perceived Usefulness, Perceived Ease of Use, Trust, Perceived Risk	Intention to Transact Online
Shang, R.-A., Chen, Y.-C. and L. Shen (2005)	Extrinsic Versus Intrinsic Motivations for Consumers to Shop On-line	Perceived Usefulness, Perceived Ease of Use, Fashion Involvement, Cognitive Absorption	Shopping Online
Teo, T.S., Lim, V.K. and R.Y. Lai (1999)	Intrinsic and Extrinsic Motivation in Internet Usage	Perceived Enjoyment, Perceived Usefulness, Perceived Ease of Use	Internet Usage
Yi, M. Y. and Y. Hwang (2003)	Predicting the Use of Web-based Information Systems: Self-efficacy, Enjoyment, Learning Goal Orientation, and the Technology Acceptance Model	Usefulness, Ease of Use, Application Specific Self-Efficacy	Behavioural Intention => Use
Van der Heijden, H. (2004)	User Acceptance of Hedonic Information Systems	Perceived Enjoyment, Perceived Usefulness, Perceived Ease of Use	Intention to Use

Author/s and Publication Year	Article title	Independent (Influencing) Variables	Dependent Variable (Outcome)
Venkatesh V. and F.D. Davis (2000)	A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies	Perceived Usefulness, Perceived Ease of Use, Subjective Norm	Intention to Use => Usage Behaviour

A number of criteria could influence perceived usefulness and perceived ease of use. An illustration which factors could determine both factors is given by Figure 6. Some factors such as navigation, interactivity, services can be influenced by the system whereas others cannot or can hardly be influenced by the system and its provider, i.e. expectations, experience or the connection speed of the user.

Furthermore, models can be found which are similar to TAM but the constructs are named differently, e.g. the IS success model (DeLone and McLean 1992) which forms the basis of the next sub-section.
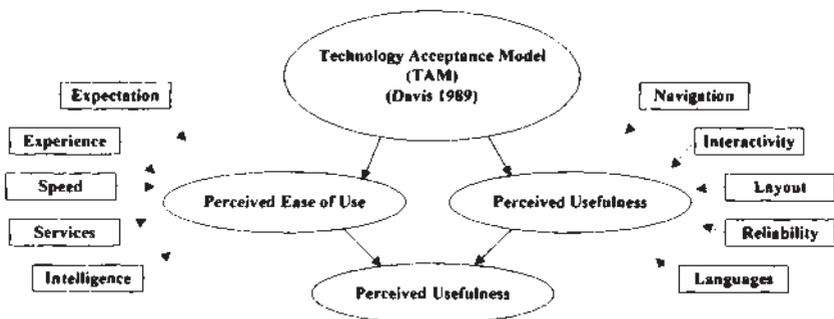
**Figure 6. TAM and Possible Influencing Factors
(adapted from Davis 1989)**

2.4.2   The IS Success Model

The IS Success Model originally proposed by DeLone and McLean (1992) included two major dimensions (system quality and information quality) to explain use and user satisfaction (these two further influence the individual and organisational impact). System quality is concerned with the information processing itself whereas information quality means basically the content. These two dimensions are very similar to ease of use and usefulness. Later, DeLone and McLean (2002) added service quality to the IS Success Model. They adapted service quality from the SERVQUAL measurement instrument (Parasuraman et al., 1988). Three factors (responsiveness, assurance and empathy) were included under the overall term of service quality. Negash et al. (2003) used the same combination of independent variables but added the factor "tangible reliability" such as a modern looking interface, appealing material or dependability to the construct service quality. Lee and Kozar (2005) added the construct vendor-specific quality. Vendor-specific quality comprises the vendor's awareness, reputation and price competitiveness. Table 2 gives an overview of the original IS Success contributions as well as of extension and confirmation studies.

Table 2. Selected IS Success Model-Related Contributions

Author/s and Publication Year	Article title	Independent (Influencing) Variables	Dependent Variable (Outcome)
DeLone, W.H. and E.R. McLean (1992)	Information Systems Success: the Quest for the Dependent Variable	System Quality, Information Quality	Use, User Satisfaction => Individual Impact => Organizational Impact
DeLone, W.H. and E.R. McLean (2003)	The DeLone and McLean Model of Information Systems Success: A Ten-Year Update	System Quality, Information Quality, Service Quality	Use (Intention to Use), User Satisfaction => Net Benefits

Author/s and Publication Year	Article title	Independent (Influencing) Variables	Dependent Variable (Outcome)
Lee, Y. and K. A. Kozar (2005)	Investigating the Effect of Website Quality on E-Business Success: An Analytic Hierarchy Process (AHP) Approach	Information, System, Service and Vendor-Specific Quality	Choice of the Most Preferred Website
McGill, T., Hobbs, V. and J. Klobas (2003)	User-Developed Applications and Informations Systems Success: A Test of DeLone and McLean's Model	System Quality, Information Quality	User Satisfaction => Intended Use and Perceived Individual Impact => Organizational Impact
Negash, S., Ryan, T. and M. Igbaria (2003)	Quality and Effectiveness in Web-based Customer Support Systems	Information, System and Service Quality	Effectiveness (User Satisfaction)
Rodgers, W., Negash, S. and K. Suk (2005)	The Moderating Effect of On-line Experience on the Antecedents and Consequences of On-line Satisfaction	Information, System and Service Quality	On-line Satisfaction, On-line Loyalty
Stockdale, R. and M. Borovicka (2006)	Using Quality Dimensions in the Evaluation of Websites	Information, System and Service Quality	None (was an evaluation instrument development)

2.4.3 Flow

Another concept dealing with human-computer interaction is Flow. Originally, the term "Flow" comes from psychology and was introduced by Csikszentmihalyi in 1975. Often Flow was validated in a sports context like kayaking e.g. Jones, et al. (2000). Csikszentmihalyi (1975) tested Flow when playing chess, dancing, climbing rocks, or even working. However, Flow can be found experiencing almost every activity including surfing the WWW (King, 2003). Hoffman and Novak (1996) and Novak, Hoffman and Yung (2000) adapted Flow to the web context. They tested Flow and its constructs on a general level meaning no specific web sites were involved.

Flow is described as a state of mind where the user is completely devoted to the use of a system and forgets everything else around him or her, like time. Thus, the aim is to create a compelling online experience to facilitate Flow. An important condition to make Flow possible is that the person's perceived skills match the person's perceived challenge (Csikszentmihalyi, 1975; Hoffman & Novak, 1996; King, 2003). If a state of boredom or anxiety occurs Flow cannot be experienced.
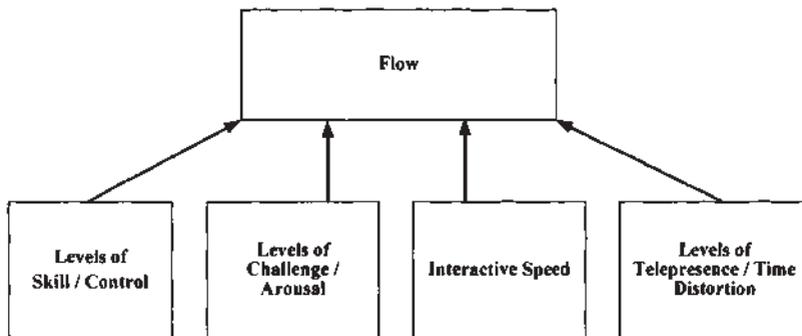
Figure 7. Flow and its Direct Influences in CME
(Novak et al., 2000)

Figure 7 illustrates the direct influences determining the cognitive state of Flow. The ultimate goal to achieve is not Flow but differs according to the area of application, e.g. shopping behaviour (Smith & Sivakumar, 2004), intention to purchase (Korzaan, 2003), positive affect and exploratory behaviour (Hoffman &

Novak, 1996) and furthermore, a compelling customer experience in the online environment (Hoffman & Novak, 1996; Novak, Hoffman, & Yung, 2000).

Skill was defined by Novak et al. (2000) as the user's capacity to act during online navigation. However, Skadberg and Kimmel (2004) had a different view about "skill" in their study about Flow on the web. They defined it as the user's knowledge about the web site's topic. Control refers to two aspects (Novak et al., 2000). First, how is the user's perceived ability to navigate on the web site? How is the web site responding to inputs?

Challenge was defined by Hoffman and Novak (1996) as the user's available possibilities of action and arousal being the "theoretical correlate of challenge" (Novak et al., 2000). The interactive speed deals with questions such as the loading time of the web site or the computer's response time (Novak et al., 2000).

Telepresence is the mediated perception of the environment (Steuer, 1992). According to Steuer (1992) the user perceives two environments. The first one is the physical one and the second is the CME. A person not only perceives the real environment when surfing a site but also the virtual environment (Skadberg & Kimmel, 2004). Telepresence occurs when the virtual environment is perceived as more dominant or real than the actual physical (Novak et al., 2000). Time distortion was operationalised by "loosing track of time" and "time goes by quickly" by Novak, et al. (2000).

Indirect influences on Flow are importance to the user (i.e. involvement, intrinsic interest), focused attention, interactive speed and the experience a person has using the Internet (Novak et al., 2000). Focused attention was defined by Csikszentmihalyi (1975) as the "centering of attention on a limited stimulus field". Operationalisation included questions concerning intent absorption or full concentration (Novak et al., 2000). Table 3 outlines selected approaches dealing with Flow.

Finneran and Zhang (2003) included flow in their so-called Person, Artifact, Task (PAT) Model. These three factors serve as flow antecedents. The person's characteristics are influenced by trait attributes (i.e. personality which is hard or impossible to change) and state attributes (e.g. mood) which is dynamic. Artefacts are the tools and in the case of the Internet the web site. The task is the specific goal a user wants to perform.

According to Hearst et al. (2002), browsing should be supported that the flow of interaction is not inhibited. The chain of thought should not be interrupted.

Such supporting features could be relevance feedback ("more like this") or query previews (to avoid empty or very few results) in the context of personalised internet applications.

Table 3. Selected Flow-related Approaches

Author/s and Publication Year	Article title	Independent (Influencing) Variables	Dependent Variable (Outcome)
Hoffman, T.P., and Novak D.L. (1996)	Marketing in Hypermedia Computer-Mediated Environments: Conceptual Foundations	Telepresence / Time Distortion, Focused Attention, Interactive Speed, Skill / Control, Challenge / Arousal	Flow (=> Positive Affect, Exploratory Behaviour)
Novak, T.P., Hoffman, D.L. and Y.-F. Yung (2000)	Measuring the Customer Experience in Online Environments: A Structural Modeling Approach	Skill / Control, Challenge / Arousal, Interactive Speed, Telepresence / Time Distortion	Flow
Finneran, C.M. and Zhang, P. (2003)	A Person-Artefact-Task (PAT) Model of Flow Antecedents in Computer-Mediated Environments	Person, Artifact, Task	Flow Experience => Flow Consequences

Author/s and Publication Year	Article title	Independent (Influencing) Variables	Dependent Variable (Outcome)
Skadberg and Kimmel (2004)	Visitors' Flow Experience While Browsing a Web Site: its Measurement, Contributing Factors and Consequences	Telepresence, Domain Knowledge / Skill, Information in the Web Site / Challenge	Optimal Flow Experience => Increased Learning => Changes of Attitude & Behaviour

Flow is undoubtedly an interesting and valuable contribution. However, doubts remain that the above named constructs like telepresence, the state of flow or focused attention can be measured reliably. Nevertheless, it is suggested that hedonic factors become more and more important. Therefore, additional endeavours considering hedonic influencing factors will be outlined in the following section.

2.4.4   Hedonic aspects

The importance of emotions is recognised more and more in the e-commerce world (e.g. Gonzáles, et al., 2002, Arnold and Reynolds, 2003). However, the importance of hedonic driven motivations is investigated in the field of consumer behaviour as well (e.g. Hirschman and Holbrook, 1982, McAlister and Pessemier, 1982). Therefore, a literature review of hedonic influences in a general consumer behaviour context is given followed by an overview of approaches integrating the hedonic dimension in web consumer behaviour.

2.4.4.1   General Consumer Behaviour Context

Hedonic-driven aspects of consumption and consumer behaviour were already considered as important influencing factors long before the satisfaction

and acceptance research for information systems (IS) and web-based systems began.

Hirschman and Holbrook (1982) outlined that consumption and consumer behaviour is motivated by hedonic influences such as fantasy, emotive and multisensory aspects. Such factors could be tastes, sounds, scents, visual or tactile appeals. They argued that experiential aspects such as consumer fantasies, feelings and fun aspects should be considered as important variables in the consumption process (Holbrook & Hirschman, 1982). Laros and Steenkamp (2005) investigated emotions with their positive (i.e. contentment, happiness) and negative effects (i.e. anger, shame, fear, sadness) in the field of consumer behaviour.

Already in 1979, Zuckerman pointed out the concept of sensation seeking which he relates to entertainment, fashion or food. Raju (1980) investigated in his study the relationships between personality traits, exogenous variables (such as age, education), the arousal seeking tendency (optimum stimulation level) and in turn the exploratory tendencies. McAlister and Pessemier (1982) conducted an interdisciplinary review for the concept of variety seeking behaviour. Varied behaviour was defined as switching between alternatives: either products or services or activities. They found out that there are two basic schools: those saying that varied behaviour is not explicable or too complex to explain. The other school argues that there are two explanations for varied behaviour: either because of variation purposes themselves or because of some other motivation (McAlister & Pessemier, 1982).

Kroeber-Riel and Weinberg (1996) distinguished between affective and cognitive behaviour. According to them affect is a short-term feeling, emotion or reaction of acceptance or rejection. A cognitive process, on the other hand, is defined as rational thinking.

Spangenberg and Voss (1997) developed a scale measuring hedonic versus utilitarian dimensions of attitude. In 2003, Voss et al., conducted a study in which they worked out a parsimonious scale including five positive and negative statements for the hedonic and for the utilitarian scale (see Table 4).

Lynch and Srull (1982) found out that higher attention is captured by providing novel or unexpected information. They called it the phenomenon of selective attention. Bettman and Luce (1998) made an even stronger proposal by suggesting that consumers' attention is caught involuntarily if novel, unexpected, surprising or extremely salient information is presented.

Baumgartner and Steenkamp (1996) as well as Steenkamp and Burgess (2002) outlined in their studies the exploratory tendencies in consumer behaviour. The purposes of the consumer when pursuing exploratory shopping behaviour are for example to experience novel and exciting purchases, avoid boredom, satisfy curiosity or being innovative (Baumgartner & Steenkamp, 1996). They also developed a scale of exploratory buying behaviour tendencies (EBBT).

Table 4. Hedonic – Utilitarian Scale
(Voss et. al., 2003)

ITEMS			
UTILITARIAN		HEDONIC	
Effective	Ineffective	Not fun	Fun
Helpful	Unhelpful	Dull	Exciting
Functional	Not functional	Not delightful	Delightful
Necessary	Unnecessary	Not thrilling	Thrilling
Practical	Impractical	Enjoyable	Unenjoyable

A few examples were given of how emotional or variety-seeking factors are considered in consumer behaviour research. These ideas are increasingly applied for IS and web-based applications as well.

2.4.4.2   Online or Information Technology Context

Enjoyment, playfulness, fun, exploratory browsing behaviour – these are some attempts used to describe the hedonic component of a web site visit and an online recommendation process. Several studies (e.g. Moon and Kim, 2001, Teo, et al., 1999) investigated its influence and demonstrated the importance of these factors.

These hedonic components, the desire for exploration, the feeling of joy, pleasure, fun during the interaction with the website presents a certain kind of motivator factor. According to Zhang and Dran (2000) there are two types of web site factors: hygiene and motivator factors. The first make a web site functional and serviceable, these are factors absolutely necessary for a Web site. User dissatisfaction is very likely to be caused if these characteristics are not available on the respective sites. The latter ones are factors which are not

necessary but which may create additional value and contribute to user satisfaction. In their study they found out that enjoyment, cognitive outcomes and visual appearance are (among others) so-called motivator factors (Zhang & Dran, 2000).

Van der Heijden and Sorensen (2003) applied an extended hedonic / utilitarian scale (HED/UT scale) to the context of mobile information service. Childers, et al. (2001) argued in their research about online retail shopping that a web site provider has to consider both aspects: hedonic and utilitarian drivers. The increasing importance of hedonic components requires establishing a so-called "Webmosphere" by design and interactive features.

According to Betts (2001) four types of online shopping visits can be distinguished:

⇨ Directed-purchase visits: the consumer buys right away.
⇨ Search and deliberation visits: the consumer is searching information about a product / service and intends to purchase.
⇨ Hedonic-browsing visits: shopping is done primarily for pleasure or recreation.
⇨ Knowledge-building visits: exploratory browsing is pursued to learn more about the marketplace which could influence long-term shopping behaviour.

Novak, et al. (2003) highlighted in their study about online consumption behaviour the distinction between goal- directed behaviour vs. experiential experiences (see Table 5). The definition of Novak, et al. (2003) is a broader one and goes beyond the concept of hedonic motivations which is just a part of the experiential behaviour. Furthermore, experiential behaviour could involve fun aspects, non-directed search or affective behaviour.

Table 5. Goal-directed and Experiential Online Behaviour
(Novak et al., 2003)

Goal-Directed	Experiental
Extrinsic motivation	Intrinsic motivation
Instrumental orientation	Ritualized orientation
Situational involvement	Enduring involvement
Utilitarian benefits/value	Hedonic benefits/value
Directed (prepurchase) search	Nondirected (ongoing) search; browsing
Goal-directed choice	Navigational choice

Goal-Directed	Experiental
Cognitive	Affective
Work	Fun
Planned purchases; repurchasing	Compulsive shopping; impulse buys

Rodgers, et al. (2005) included in their measurement scale about information quality the dimension entertainment which they operationalised with entertaining, enjoyable, pleasing and fun to use.

Eroglu et al. (2003) emphasised the importance of online atmospheric cues which have an effect upon the user's emotional and cognitive states and in turn, influence the shopping outcome. Their model of Stimulus-Organism-Response is outlined in Figure 8. Richard (2005) investigated the influence of internet atmospherics on purchase intentions and included constructs such as exploratory behaviour, entertainment, but also navigational cues and structure in her research model.

When speaking of hedonic dimensions of web consumer behaviour the term "Exploratory Browsing Behaviour" arises. Exploratory Behaviour can be defined as browsing the web and visiting sites or links because of curiosity or variety-seeking (Korzaan, 2003). Huang (2000) explored online exploratory shopping behaviour and found out that novelty, contrasting, surprising and/or rare information, product or service, is a driving factor for the desire to explore a web site.

According to Mycoted (2004), a creativity and innovation company, three forms of browsing can be distinguished:
- ⇨ *Purposive browsing:* the user is looking for a specific pre-defined piece of information (utilitarian browsing behaviour, the goal is to find useful information)
- ⇨ *Capricious browsing:* information is randomly examined and there is no specific objective.
- ⇨ *Exploratory browsing:* inspiration is sought.
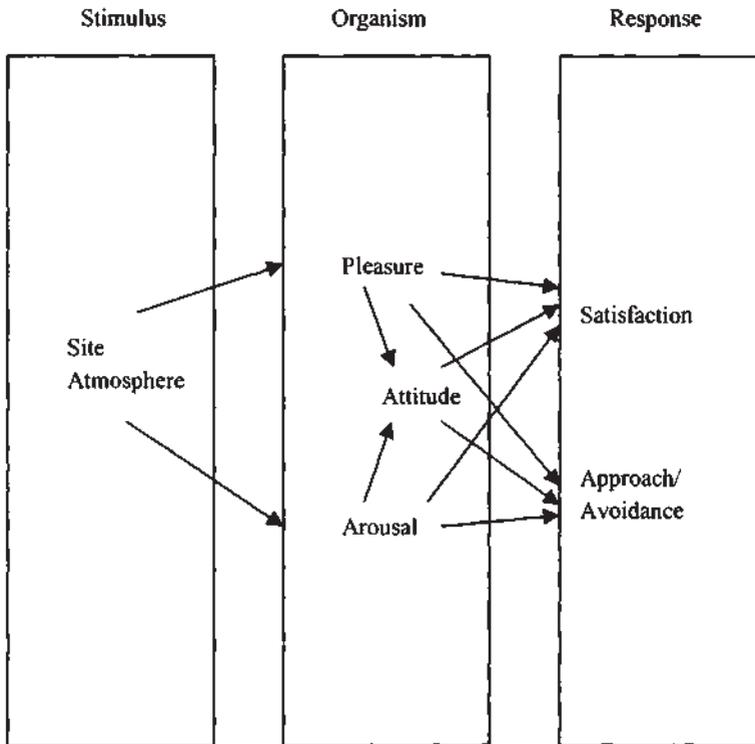
Figure 8. Pleasure and Arousal Components
of a Stimulus Organism Response Model (Eroglu, et al., 2003)

Rowley (2002) differentiates further between intentional and unintentional browsing and controlled and uncontrolled browsing environments. Intentional browsing is described as additional information seeking due to insufficient information whereas unintentional browsing occurs if e.g. the search strategy was inappropriate. Controlled or uncontrolled browsing events could be facilitated by the web site provider – e.g. is the web site intended to encourage browsing proactively by features that attract attention or induce browsing (Rowley, 2002)?

According to Davis, Bagozzi and Warshaw (1992) and Moon and Kim (2001) the construct perceived enjoyment is the extent to which the activity of using the computer is perceived to be related to enjoyment and pleasure itself,

apart from any performance consequences or extrinsic rewards. Van der Heijden (2004) added in his study about online user acceptance the construct perceived enjoyment to the TAM constructs perceived usefulness and perceived ease of use. The measurement of perceived enjoyment was affected by using four bipolar scales: enjoyable – disgusting, exciting – dull, pleasant – unpleasant, interesting – boring.

Similarly the concept of playfulness is understood to be one's belief that interacting with the WWW constitutes an intrinsic motivation factor and was found to have an influence on attitude, intentions and/or actual usage (Moon & Kim, 2001; Morosan & Jeong, 2006).

Cognitive Absorption (CA) is another popular concept dealing with intrinsic motivations of users. Shang, et al. (2005). used cognitive absorption as antecedent for perceived ease of use and usefulness as well as a direct influencer on online shopping behaviour. Saade and Bahli (2005) defined cognitive absorption as a state of deep involvement with the system. Such holistic experiences like enjoyment can be measured with the concept of CA. CA served as an antecedent for perceived ease of use and usefulness and had three dimensions in the study of Saade and Bahli: temporal dissociation, focused immersion and heightened enjoyment. Agarwal and Karahanna (2000) referred to CA as holistic experiences with technology and measured the construct with 5 dimensions. They applied control and curiosity additionally to the other three dimensions of Saade and Bahli.

When comparing the concept of CA to Flow some similarities arise. The dimensions of temporal dissociation and focused immersion of Agarwal and Karahanna (2000) and Saade and Bahli (2005) resemble time distortion and focused attention in the application of the concept of Flow of Hoffman and Novak (1996) and Novak, et al. (2000). Saade and Bahli included control which was considered by Hoffman and Novak (1996) and Novak, et al. (2000) as well.

The pending question is now: which buzzwords were mentioned in connection to online behaviour which is motivated hedonically? Figure 9 gives an idea of different concepts and models found but is not intended as an exhaustive enumeration. Furthermore, it is important to note that some of the constructs mentioned were used as antecedents by some studies whereas in others they served as direct influencers on the dependent variable, e.g. satisfaction or online behaviour.
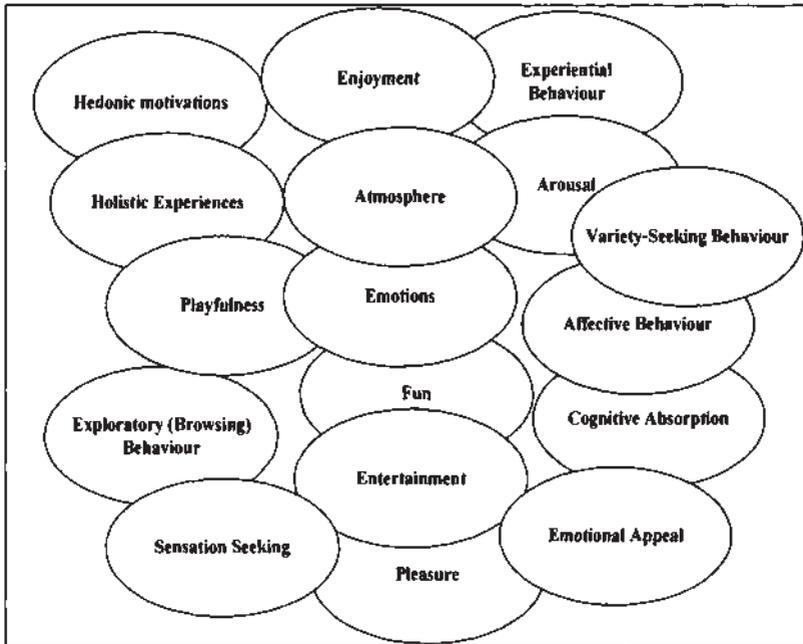
Figure 9. Concepts of Hedonic Motivated User Behaviour

2.4.5 Other Approaches

Apart from the models mentioned in further sub-sections, there are other endeavours having nothing or not a lot in common with the approaches mentioned before. Often, they deal with social norms or accessibility in the form of e.g. facilitating conditions. Cheung, Chang et al. (2000) found support that facilitating conditions and social factors are two factors having a major influence on WWW usage. Facilitating conditions are considered to be relevant to the topic of personalised internet applications as well since they can be interpreted as the availability of necessary resources and support given by the system.

The Social-Economic-Psychological (SEP) model developed by Konana (included in Table 6) and the Balasubramanian (2005) model takes three perspectives, i.e. social, economic and psychological factors into consideration to explain trust, hedonic and utilitarian gains and in turn satisfaction. Although the model was intended to explain adoption and usage of technology for investors

transacting online it can be of general significance by providing a multidisciplinary point of view on online consumer behaviour.

Table 6. Overview of Other HCI Approaches

Author/s and Publication Year	Article title	Independent (Influencing) Variables	Dependent Variable (Outcome)
Cheung, W. Chang, M.K. and V.S. Lai (2000)	Prediction of Internet and World Wide Web Usage at Work: A Test of an Extended Triandis Model	Facilitating Conditions, Social Factors, Affect, Consequences, Complexity	Current WWW Usage
Doll, W.J. and G. Torkzadeh (1988)	The Measurement of End-User Computing Satisfaction	Content, Accuracy, Format, Ease of Use, Timeliness	End-User Computing Satisfaction
Dos Santos, B.L. and M.L. Bariff (1988)	A Study of User Interface Aids for Model-Oriented DSS	Model Manipulation, Report Content, Presentation of Outcomes	Problem Identification and Prioritization
Hsu, M.-H. and C.-M. Chiu (2003)	Internet Self-Efficacy and Electronic Service Acceptance	Interpersonal Norm, Social Norm, Attitude, Web Self-Efficacy, Perceived Controllability	Intention => E-Service Usage
Liang, T.-P. and J.-S. Huang (1998)	An Empirical Study on Consumer Acceptance of Products in Electronic Markets: A Transaction Cost Model	Uncertainty, Asset Specifity, Transaction Cost	Acceptance (of Products in Electronic Markets)

Author/s and Publication Year	Article title	Independent (Influencing) Variables	Dependent Variable (Outcome)
Konana, P. and S. Balasubra-manian (2005)	The Social-Economic-Psychological Model of Technology Adoption and Usage: an Application to Online Investing	Social, Economic, Psychological Factors	Utilitarian Gains, Hedonic Gains, Trust => Satisfaction
Stone, R.W. and J.W. Henry (2003)	The Roles of Computer Self-Efficacy and Outcome Expectancy in Influencing the Computer End-User's Organizational Commitment	Computer Self-Efficacy, Outcome Expectancy	Organizational Commitment

An overview of different concepts applied to explain HCI and behaviour in computer-mediated environments (CMEs) was given. These approaches were helpful to develop the research model of this study. However, the author believes that none of these models can be used one-to-one to explain adoption, satisfaction or acceptance with personalised internet applications. Emerging factors such as trust or exploratory browsing behaviour have to be particularly considered. The next sub-chapter about design aspects is intended to give additional insights about possible evaluation factors and the assessment procedure.

2.5 User Interface Design Aspects

Effective web site design is an often employed term used in connection with web site satisfaction. The question arising is how does a web site design become efficient and satisfactory for the user? Several approaches are discussed and again, multi-disciplinary contributions can be found. Technical and functional requirements can play a crucial role. Obviously, user requirements are equally important and human-centred design (HCD) or user-centred design (UCD)

approaches are applied more and more. Often the terms are used interchangeably but there are contributions highlighting a difference, e.g. in the way the technology is designed (Gasson, 2003). However, a quite common understanding of the Information Systems (IS) community is that the success of a system is proportional to the degree of user involvement in a system's design and development phase (Carmel, Whitaker, & George, 1993). Since this study focuses on user evaluation, only the user perspective of interface design will be discussed.

According to ISO 13407 (Kirakowski, 2003) human-centred design involves four key principles:

- The active involvement of users and specification of their requirements
- An appropriate allocation of function between users and technology
- Iterative design solutions (by receiving user feedback)
- Multi-disciplinary design (involving not only developers but also end-users and usability specialists).

For better illustration some examples of different design methods will be given. Participatory design (PD) is an approach originally developed for workplace information systems. There is no exact definition of PD; flexible practices are applied to include the user in the design process (Carmel et al., 1993). Contextual design or inquiry is a field study method researching the tasks and needs of users in their environment by e.g. observing them performing tasks (Smart & Whiting, 2001). Joint Application Design (JAD), a very popular design method involving user participation, employs several users to state their point of view in an organised manner of workshops or group meetings (Carmel et al., 1993; Davidson, 1999; Purvis & Sambamurthy, 1997).

Norman (2004) outlined in his book about Emotional Design three levels of design. First and most important, he mentioned visceral design meaning the physical features like how the web site looks and sounds. Second, he argued that behavioural design should be considered. This type of design is about using the web site and its performance. Behavioural design has basically four components: functions, understandability, usability and physical feeling. The last level, reflective design is about the meaning of a product service, the interaction and the long-term customer experience.

When speaking of design aspects often the term "usability" arises. Therefore, this topic will be outlined briefly. According to Lindgaard (1994) usability is defined as the ease of learning and using computer systems (for novices as well

as for experienced users). In ISO (International Standards Organisation) 9241 (ISO, 1998) usability is "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use". In the author's opinion the definition "usability" is often used similarly with the construct perceived ease of use of the TAM. However, the definition of ISO is a broader one, covering more aspects than perceived ease of use. Usability becomes particularly important when focusing on the next chapter of system evaluation.

2.6 System Evaluation

This chapter is structured chronologically starting with software evaluation methods already developed before web site evaluation became an issue. The reason for the review is that useful methods or standard questionnaires could be borrowed for web site evaluation as well. The next sub-section is devoted to the specific topic of web site assessment.

2.6.1 Software Evaluation Methods

System and software evaluation became significant long ago before the Web discussion began with the goal to avoid user dissatisfaction or to increase employees' efficiency. According to ISO 9126 (ISO/IEC, 1991) there are six software quality characteristics: functionality, reliability, usability, efficiency, maintainability and portability. The factor which turned out to be most important (and which is often used as an overall term for all six characteristics named above) is definitely usability already mentioned in chapter 2.5 (Henderson, Podd, Smith, & Varela-Alvarez, 1995; Lin, Choong, & Salvendy, 1997). Usability is discussed and measured by numerous contributions (e.g. Lindgaard, 1994; Henderson et al., 1995; Oppermann and Reiterer, 1997; Lin et al., 1997).

Different categorisation approaches for software evaluation methods exists. A possibility is to distinguish between formative and summative evaluation. The first is the assessment of a system still in the prototype design stage whereas the latter focuses on a final, already fully operational system with the goal to measure efficacy or to compare two systems (Hartson, Andre, & Williges, 2001). Hilbert and Redmiles (2000) classified evaluation methods either if they are predictive, observational or participative. The first one includes cognitive walkthroughs or expert reviews. Observational evaluation is based on

observation of users while testing a prototype or an already functioning system. The latter, participative evaluation is the collection of users' subjective opinions by questionnaires or interviews.

An adapted version of Oppermann and Reiterer's (1997) classification scheme for software evaluation will serve as a basis to distinguish between the broad categories of evaluation (see Table 7). Not all of the methods named in each category will be discussed in greater detail; the attention will be paid to the most popular methods.

Table 7. Classification of Software Evaluation Methods
(Oppermann & Reiterer, 1997)

Subjective evaluation methods
❖ Questionnaires
❖ Interviews
Objective evaluation methods
❖ Observations
❖ Video recording
❖ Interaction based (e.g. logging)
Expert evaluation methods
❖ Checklists and guidelines
❖ (Cognitive) walkthroughs
❖ Specialists reports and heuristic evaluation
Experimental evaluation methods

Starting with subjective evaluation methods, questionnaires are popular and widespread to collect user opinions. Usability plays a central role when evaluating a system. According to Dillon (2003), the term "Usability Testing" in a general sense means all kind of User Interface (UI) inspection methods such as heuristic evaluations, expert reviews and cognitive walkthroughs. Usability testing in a more specific sense describes an evaluation procedure, which comprises the performing of tasks by users. Several contributions exist which contain some kind of "standard questionnaires" facilitating the evaluation of a system. They were created to have a reliable tool measuring the users' point of

view and covering all relevant areas of system evaluation. Approaches range from very simple and quick questionnaires, e.g. the System Usability Scale (SUS, Brooke, 1986), Nielsen's Heuristic Evaluation and Nielsen's Attributes of Usability (Nielsen, 1993) - to more comprehensive ones. The Software Usability Measurement Inventory (SUMI, Human Factors Research Group, 2002) contains around 50 questions, the Questionnaire for User Interaction Satisfaction (QUIS, Chin et al., 1988) covers five areas to be rated: overall reactions to the system, screen, terminology and system information, learning and system capabilities. IBM developed some usability satisfaction questionnaires (Lewis, 1995): the After-Scenario Questionnaire (ASQ), the Post-Study System Usability Questionnaire (PSSUQ) and the Computer System Usability Questionnaire (CSUQ). The Purdue Usability Testing Questionnaire (PUTQ) was designed to evaluate the usability of all kind of software products (Lin et al., 1997). The questionnaire is very extensive using 100 questions to gain knowledge about a system's consistency, flexibility, learnability or user guidance. Table 8 gives an overview of the topics covered by PUTQ and a few example questions for each area.

The second subjective assessment approach, the interview, is often time-, cost and/or staff-intensive although it can be productive by giving new insights (which would not be covered by a pre-defined questionnaire) because the interviewer can ask specific issues of concern (Shneiderman, 1992). Interviews are particularly useful when the study is an exploratory one (Oppermann and Reiterer, 1997).

Objective evaluation methods include observations which can be either realised in the field or in the laboratory. Since observations are complex tasks, they are often complemented by video-taping or the logging of data (Lindgaard, 1994). Video-taping is a useful method because every reaction of the user such as eye-movements can be tracked and analyzed. The use of an automated data tracking method by collecting and analysing usage data seems to be the most comprehensive approach of objective evaluation methods. All possible interactions can be tracked: e.g. number of errors, trials, task time.

Expert evaluation methods range from simple guideline or checklist reviews to more extensive approaches. The cognitive walkthrough is a technique for evaluating the design of a user interface, with special attention to how well the interface supports "exploratory learning," i.e., first-time use without formal training (Rieman, Franzke, & Redmiles, 1995). According to Ivory and Hearst (2001) the expert has to simulate users' problem solving. In the cognitive walkthrough, the sequence of actions refers to the steps that an interface will

require a user to go through in order to accomplish some task. The evaluators then step through that action sequence to check for potential usability problems.

**Table 8. An overview of PUTQ areas
with example questions (Lin et al., 1997)**

Compatibility Is the wording familiar? Is the control matched to user skill?
Consistency Is the feedback consistent? Is the wording consistent with user guidance?
Flexibility Does it provide flexible user guidance? Are users allowed to customize windows?
Learnability Is the ordering of menu options logical? Is the data grouping reasonable for easy learning?
Minimal Action Does it provide default values? Does it require minimal steps in sequential menu selection?
Minimal Memory Load Are selected data highlighted? Are prior answers recapitulated?
Perceptual Limitation Does it provide easily distinguished colours? Are groups of information demarcated?
User Guidance Is HELP provided? System feedback: how helpful is the error message?

Another technique, the heuristic evaluation, is defined by Lindgaard (1994) as a detailed informal subjective usability analysis conducted by experts simulating the perspective of a typical end user. The evaluators do not follow a specific set of methods, rules or procedures; instead they rely on a set of vague guidelines. By performing a heuristic evaluation the experts identify violations of certain heuristics, i.e. some pre-defined principles (Ivory and Hearst, 2001). In addition to the cognitive walkthrough, the heuristic evaluation is an in-depth analysis collecting all occurred problems, from the highly serious to the most

trivial. However, the judgements of experts underlie some subjectivity and are influenced by their experience, background and talent in anticipating what a user finds easy or difficult when using a system (Oppermann and Reiterer, 1997).

Lindgaard (1994) distinguishes various data collection methods for usability testing being classified by the time of collection and if the data collection is conducted in the field or laboratory (see Figure 10).
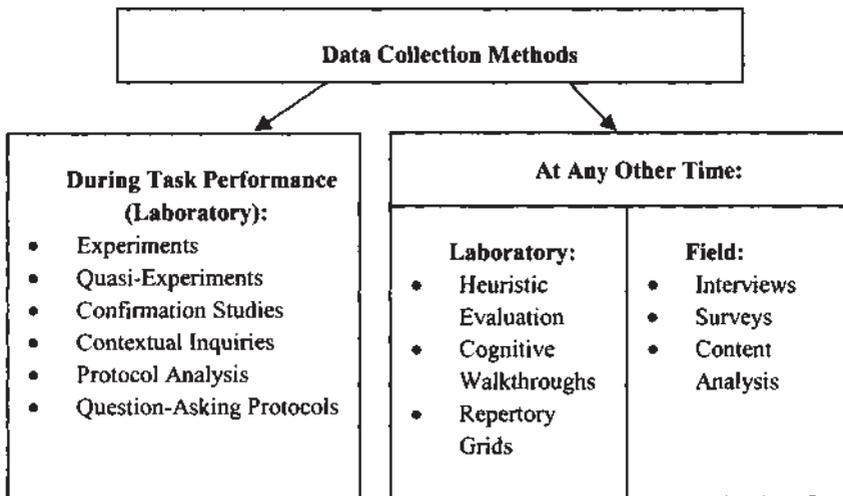
Figure 10. Examples of Data Collection Methods for Usability Testing (adapted from Lindgaard 1994)

Experiments can be classified as a method in which the experimental situation is exactly defined; a main characteristic is the variation of the independent variables. However, with quasi-experiments the experimenter does not exert control over all of the variables (Lindgaard, 1994). Confirmation studies serve as an assessment of usability defects detected in heuristic evaluations. The goal when performing contextual inquiries is to discover design opportunities during user interactions. A protocol analysis is a record of test person's comments, suggestions, or problems occurred with a system. When question-asking protocols are employed to assess usability; predetermined questions are asked (Lindgaard, 1994).

The laboratory data collection methods heuristic evaluation and cognitive walkthrough were already described above. Applying the technique of repertory grids means that different systems or tasks are proposed and test persons make judgements about differences or similarities. As far as the field methods are concerned the often applied techniques, interview and survey, have to be mentioned.

This sub-section was intended to give an overview about software and usability evaluation methods. The next sub-section focuses more specifically on the assessment of web sites and possible techniques.

2.6.2   Web Site Evaluation Methods

The knowledge about a web site's effectiveness is essential to make improvements and to have a successful site. Therefore, the need for an appropriate evaluation method is obvious. An assessment is simply a necessity, a prerequisite to discover strengths and weaknesses. A number of studies on the effectiveness of web sites were already conducted. They range from simple rankings, awards, guidelines to highly complex evaluations. An overview of different web site evaluation methods will be given.

A possible distinguishing factor is whether qualitative measures such as protocol analysis (e.g. Benbunan-Fich, 2001) or quantitative methods like web site metrics (e.g. Olsina and Rossi, 2001, Ivory et al., 2000, Wöber et al., 2002) are applied. Although qualitative investigations allow gaining deeper insights of specific problems occurring; they tend to be more subjective and less comparable. Quantitative Web site evaluation can be performed in the way of judging site structure, technical parameters, and content or server characteristics. Predetermined categories and attributes are used to assess the Web. Log file analysis is a typical example of a method relying solely on a quantitative data collection by using traffic-based characteristics to establish usage patterns. Applying these quantitative evaluation methods the evaluation process is likely to be structured, accurate and comprehensible (Olsina and Rossi, 2001).

A lot of efforts have been made in developing quantitative approaches for web site measurement. These contributions range from developing benchmarking metrics or specifications (e.g. Ivory et al., 2001, Johnson and Misic, 1999, Jutla et al., 1999) to highly sophisticated Web mining tools. They can

provide useful preliminary work (data) to web site evaluations by extracting different information from web sites.

A large research area consisting of automated quantitative web site analysis was developed by means of Web mining methods. Originally, Web mining methods stem from the large research field of data mining. Data mining is defined as the extraction and the discovery of previously unknown but useful and interesting information and interrelations in large databases as to infer new knowledge (Nestorov & Tsur, 1999; Spiliopoulou, 2000). Web mining enables the systematic discovery, extraction and analysis of WWW information sources (Cooley, Mobasher, & Srivastava, 1997; Kosala & Blockeel, 2000). Figure 11 illustrates that Web mining consists of three areas (Srivastava, Cooley, Deshpande, & Tan, 2000; Zaiane, 1998).
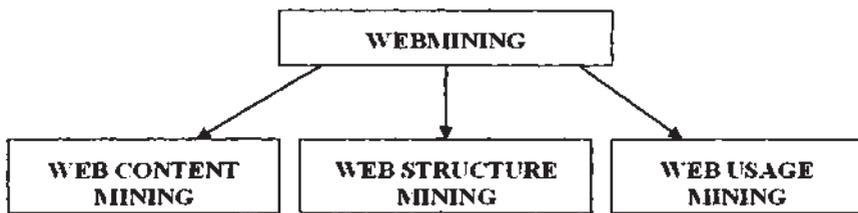
Figure 11. Three Areas of Webmining

Web content mining is defined as the discovery and analysis of content and data of the Web. Web structure mining is concerned with the structure of hyperlinks, whereas the latter, web usage mining analyses the user behaviour (Kosala and Blockeel, 2000).

A qualitative method which can be found quite often is the think aloud method or protocol analysis (e.g. Benbunan-Fich, 2001; Van Waes, 2001). Test persons are asked to say what they are thinking about the Web site they are surfing or if problems are occurring. Although protocol analysis is a feasible and efficient approach (Benbunan-Fich, 2001) there are also some drawbacks like that the situation can be quite unnatural for the test persons. A variation of the think-aloud verbal protocol analysis is the co-operative evaluation technique. Users and designers assess a system together; users are encouraged to ask questions during the interaction with the system. Similarly, evaluators can ask the user questions if problems or misunderstandings are occurring or at any other

time during the evaluation (Marsh & Wright, 1999; Yong & Kong, 1999). The obvious advantage is that the process is more natural than the 'pure' think-aloud method. Additionally, more insights can be gained because the evaluator can immediately ask about problems when he or she recognises any dissatisfaction of the user. Another popular qualitative method of web site evaluation is the cognitive walkthrough (e.g. discussed in Blackmon et al., 2002 or applied in Jacobsen and John, 2000) as already outlined before.

A further difference already mentioned above is if the assessment was conducted by automated tools or if a manual method (e.g. expert review) was chosen. While manual methods for system assessment can be valuable giving deeper insight, this type of evaluation is time-consuming and complex (particularly if a large number of web sites are to be evaluated). Besides, a certain degree of subjectivity cannot be completely avoided. An automated data gathering process is an invaluable opportunity for assessing dynamic media such as the World Wide Web (Scharl, 2000).

Olsina (2003) divided evaluation methods by categories, i.e.: testing, inspection, inquiry and simulation. A similar categorisation can be found in Ivory (2003). The respective methods for each category (derived from Ivory, 2003, Nielsen, 1993, Olsina, 2003) are shown in Table 9.

As far as the data collection used for this study is concerned the method of inquiry, a user survey, will be applied. First, study participants are asked to do a pre-determined task simulating real problem solving with a personalised internet application. Afterwards they are asked to evaluate the system according to usability and HCI issues by answering a questionnaire. The questionnaire finishes with some general demographic and internet usage questions. The procedure will be further outlined in Chapter 4.

**Table 9. Web Site Evaluation Methods by Categories
(Ivory, 2003, Nielsen, 1993, Olsina, 2003)**

- **Testing**
  - *Thinking-Aloud-Protocol* (Users talk aloud while testing a Web site)
  - *Testing of System Performance* (e.g. speed)
  - *Web Log-File Analysis* (data recording of a user interaction)
  - *Remote Testing* (users and evaluators are separated)
  - *Contents Testing* (relevancy, consistency, timeliness of the content)

- **Inspection** (performed by one or more experts)
  - *Guideline Review*
  - *Heuristic Evaluation* (review of usability principles, i.e. heuristics) and *Estimation* (an evaluators' prediction of usability)
  - *Cognitive Walkthrough* (simulation of users' problem solving task)
  - *Feature, Consistency, Standards and Formal Usability Inspection* (e.g. review of ISO standards)

- **Inquiry**
  - *Field Observation* (users interact with a site in their environment)
  - *Questionnaires* (standard questionnaires such as PSSUQ, SUMI)
  - *User Feedback* (users submit comments and suggestions)
  - *Focus Groups* (user discussion)

- **Simulation Methods** (Simulation of a user-site interaction)

3 INFLUENCES ON PERSONALISED INTERNET APPLICATIONS' SATISFACTION – RESEARCH MODEL AND HYPOTHESES

This chapter deals with the conceptual model of the study and the hypotheses which form the basis of the analysis. A definition for each of the employed dimensions is given and the reasons why the particular influencing factors were chosen are discussed. Furthermore, the items employed to measure the respective dimensions are outlined.

3.1 Research Model

The research question of this study stems from the gap that the previously named models about HCI, e.g. the TAM is often investigated in an isolated way. At best, they are extended by some factors, e.g. web security and access costs (Shih, 2004) or perceived enjoyment (Teo et al., 1999). These models are well researched, valuable, and provide a substantial contribution to the explanation of system usage and/or satisfaction. However, they do not acknowledge the full variety of influences for the particular case of personalised internet applications. Thus, the major goal of this paper is to test a merged model including factors of the TAM and additionally adding two personal influencing factors: attitude and experience. However, the model does not yet cover any hedonic needs and fun factors or security concerns. Thus, the model was enhanced to explain more influencing factors. The concept of trust is added since its influence on personalised internet applications and e-commerce sites (on which products and services can be purchased) is crucial. Finally, the model is extended by exploratory behaviour covering the hedonic aspects of a web site visit. Figure 12 gives an overview of the main components included in the extended model.

Another objective of this study is to develop a model explaining user satisfaction with personalised internet applications. Many attempts were undertaken to evaluate websites but only a few concentrate on more intelligent systems like personalised internet applications. However, these kinds of systems require a particular careful and thorough assessment since they are intended to perform personalised services like recommendations. Furthermore, there are

features of special relevance to personalised systems. The experiential aspect plays a much greater role than for ordinary web sites because personalised applications are often employed to fulfil not only goal-directed purposes but enable inspiration as well. Finally, it is hypothesised that trust towards the web site (and information processing) has a higher significance because personal data are revealed.
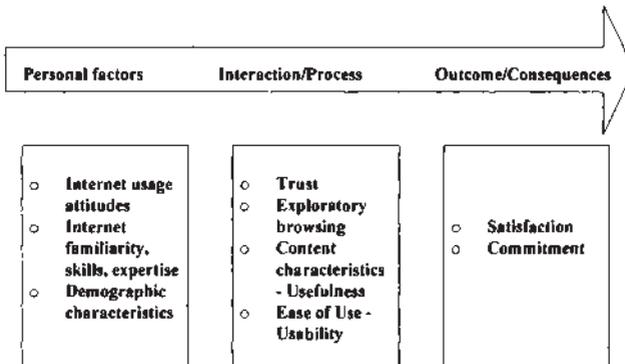
Figure 12. Components of the Conceptual Model

Figure 12 depicts the model components of this study. The influencing factors are divided into personal factors denoting the characteristics of the individual which cannot be influenced by the internet application provider. Second, there are the interaction/process characteristics which could be optimised by the web site provider. Finally, both of these characteristics do have an influence on the outcome, i.e. satisfaction with the personalised internet application and the commitment to use it again or to recommend it.

Furthermore, the relationships of these factors are of obvious importance. Which of the factors outlined above influence each other either directly or indirectly? In Figure 13 the research model and its hypothesised relationships are presented. Two competing constructs are exploratory browsing behaviour and enjoyment. Since exploratory browsing behaviour is hypothesised to be the more appropriate construct in the context of personalised internet applications, enjoyment is shown only by dotted lines in the research model. A research model including perceived enjoyment with the personalised internet applications will serve as an alternative model.
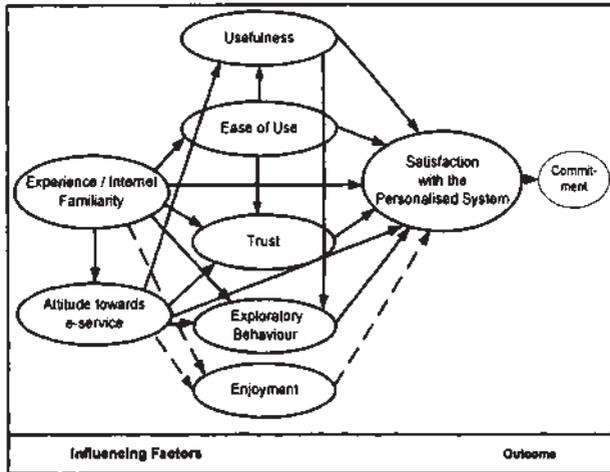
Figure 13. The Research Model

Literature review suggested that the constructs investigated in this study have an impact on satisfaction. All of the constructs are explained and the operationalisations used for each dimension are presented in the following section.

3.2 Influencing Factors – Constructs and Hypotheses

Each construct will be outlined and the reasons why it is included in the model are presented. Of course, there are several indirect relationships and some of the influencing factors do have an impact on each other (as can be seen in Figure 13). Furthermore, hypotheses about the structure of the model are outlined. Starting with usefulness and ease of use (or information quality and system quality), these are clearly one of the most important and most researched influencing factors for system usage and satisfaction.

3.2.1 Perceived Usefulness

Perceived usefulness (PU) was defined by Davis (1989) as the user's assessment that applying a particular system will increase his or her job performance. The original study of Davis was conducted in a work-related environment. However, the construct of perceived usefulness was tested with software, information systems (e.g. Bhattacherjee and Premkumar 2004), or web sites as well (e.g. Morosan and Jeong, 2006, Teo, et al., 1999 and many more). DeLone and McLean (1992) tested a similar construct they called information quality. They defined information quality as the IS output, the quality of the information. However, the construct name used in this study will be usefulness because it is better known and the author believes that usefulness is a more meaningful term than information quality. The definition employed is that using a particular personalised internet application will help to solve a specific task satisfactorily and that accurate, meaningful and helpful information is provided. The hypothesis is that the more useful a user perceives a system the higher the satisfaction will be (H1a).

The dimension of usefulness covers the following measurement items (the German version of the items are found in the appendix, a summary of all of the dimensions, their items and references are found in chapter 4.2 Development of the survey instrument):
- ❖ Overall, I find this web site being useful.
- ❖ The use of Learn@WU / immobilien.net / Tiscover did facilitate my search for learning materials / real estate / a travel.
- ❖ This web site enables me to quickly find interesting information.
- ❖ This web site is increasing the quality of my information search.

Chung and Tan (2004) found out in their study about the antecedents of playfulness that content plays a major role when thinking of playfulness. In this study, exploratory browsing behaviour is considered instead of playfulness. Nevertheless, it is expected that usefulness serves as an antecedent for exploratory browsing behaviour as well constituting hypothesis 1b. The rationale behind this hypothesis is the suggestion that only if a personalised internet application is perceived to be useful exploratory browsing is induced.

> **H1a** Perceived Usefulness is hypothesised to have a positive direct influence on satisfaction with a personalised internet application (PIA).

H1b   Perceived Usefulness is hypothesised to have a positive direct influence on exploratory browsing behaviour.

3.2.2 Perceived Ease of Use

Perceived ease of use (PEOU) refers to the user's impression that using a particular system would be free of effort (Davis, 1989). DeLone and McLean (1992) define their construct "system quality as the quality characteristics of the system itself". The concept of usability is similar to the constructs of system quality and PEOU. However, often it refers to more issues than PEOU, e.g. the norm ISO 9241 (ISO, 1998) defines usability as using a system with effectiveness, efficiency and satisfaction. The construct chosen in this study is perceived ease of use referring to the narrower concept. The definition of ease of use is that the system's use is possible without great effort and the system's use is easy to learn, e.g. the navigation path is clear. The influence of PEOU on Usefulness (H2c) was confirmed in a lot of studies (e.g. Davis, 1989, Legris, et al., 2003). Furthermore, Koufaris and Hampton-Sosa (2004) showed in their study that PEOU constitutes a weak but significant influence on trust which is therefore, proposed as hypothesis H2b in this study. Finally, it is hypothesised that PEOU exerts a direct positive influence on satisfaction with a PIA (H2a).

H2a   Perceived Ease of Use positively influences the satisfaction with a personalised internet application.

H2b   Perceived Ease of Use positively influences the level of trust with a personalised internet application.

H2c   Perceived Usefulness is influenced positively by Perceived Ease of Use.

EOU is measured in this study by the following items:
- ❖ Overall, I find this web site easy to use.
- ❖ This web site is user friendly.
- ❖ It is easy to learn how to use this web site.
- ❖ The structure of the web site is confusing.

3.2.3 Trust

Privacy and security concerns play an increasing role. Does the user trust the web site provider, the information and the way how transactions are done? Is there anything which could jeopardise trust in a web site such as logging and tracking of personal data and misusing them afterwards? How is the trustworthiness of information, of recommendations, the careful treatment of sensitive data, credit card transactions assessed by the users?

A lot of fraud incidents and attacks annoy users. A widely known example is e-mail spam. Unfortunately phishing attacks (i.e. an e-mail looking officially which is intended to convince the user to reveal passwords, PINs at a manipulated website (http://www.webopedia.com, online encyclopaedia)) or identity theft practices became well known recently. Bogus web sites (web sites offering products or services which do not exist or which disseminate misinformation), fake websites (being copies of web sites, they look the same or use similar URIs but have different contents) are other examples of the misuse of the Internet.

Trust was investigated and proven to be important by a lot of studies (e.g. Chiou, 2004, Pavlou, 2001, Yoon, 2002, Kimery and McCord, 2002) and its significance will even rise because more and more people use the Internet for financial transactions. Urban et al. (2000) argued that among others trust building cues should be used. The provision of complete and unbiased information is crucial. Furthermore, virtual-advisor technologies can increase customers' trust in the web site. The authors are even convinced that trust presents the key to online success. Hoffman et al. (1999) concluded that trust is an important issue with 95% of users have already refused to reveal personal information at web sites. Whereas 58% of Americans have trust in newspaper and television the amount of trust is dramatically decreasing when thinking of the Internet: only 26% trust online commerce sites (Carton, 2002). Even when a low risk purchase e.g. a book is bought online, trust is a significant influencing factor (Gefen, 2000). Examples from the Internet banking area show that trust does have a tremendous impact on the attitude towards using a banking service in an online environment (Suh & Han, 2002). Pavlou and Chai (2002) found out that trust has a significant influence on attitude and perceived behavioural control although it varies across cultures.

Therefore, the websites do not only need to have high security standards but also need to give the impression that one can trust that the information is processed securely. However, there is another aspect of trustworthiness: trust is

required concerning the information on the web site and the recommendations given by the system. If a user does not trust in the recommendations, it is not very likely that she/he will buy the goods/services proposed.

Trust is the subjective assessment of a user that the website provider will perform a transaction in accordance with the user's confident expectations (Ba & Pavlou, 2002). Gefen (2000) argued that trust towards an online provider is making oneself vulnerable to actions of the provider based on confidence and assurance.

Trust is defined in this study as the users believe that his or her inquiry will be treated according to his confident expectations concerning security issues.

The concept of trust proposed in this study covers the following aspects:
- ❖ Trust towards the information indicated on the web site
- ❖ Trust concerning the provision of personal information
- ❖ Trust towards the security of the system
- ❖ How are the security standards of the web site?
- ❖ Trust towards the recommendations / proposals given

      H3   Trust positively influences the satisfaction with a personalised internet application.

3.2.4   Exploratory Browsing Behaviour

Hedonic components of the web site experience are represented in this study by exploratory browsing behaviour. While various models in the HCI field try to capture the hedonic side of the on-line experiences by integrating variables such as fun, entertainment, playfulness, pleasure, or emotions in general, they do not fully acknowledge the advances in explaining consumer and especially information behaviour already elaborated. Furthermore, as personalised systems being a special form of a web site, they should encourage variety-seeking behaviour and users' browsing. Even in an e-learning context, exploratory browsing or enjoyment play a role not to be neglected (Lee, Cheung, & Chen, 2005).

Inspired by Baumgartner and Steenkamp (1996), Steenkamp et al. (2002), Steenkamp and Burgess (1996) and Huang (2000) the definition of exploratory browsing behaviour used in this study is: EBB is understood as being an

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inducement for the user to browse the web site because inspiration is offered, variety or novelty-seeking desires are satisfied or excitement is created.

The construct EBB was measured by the following items:
- ❖ Variety-seeking: The visit of the web site offered me variety.
- ❖ Inspiration: This web site inspired me.
- ❖ Curiosity: This web site induced curiosity.
- ❖ Excitement: The use of the web site was exciting.
- ❖ Novelty-seeking: The web site offered novel information / products to me.
- ❖ Pleasure: Using the web site was a pleasure.

H4 Exploratory Browsing Behaviour positively influences the satisfaction with a personalised internet application.

Furthermore, enjoyment will serve as a competing construct to exploratory browsing behaviour.

3.2.5 Enjoyment

When compared to exploratory browsing behaviour, enjoyment is certainly the construct more often used in the Web context (e.g. Van der Heijden 2004, Yi and Hwang, 2003). However, it is hypothesised that exploratory browsing behaviour in the WWW context is another appropriate construct suggested by a previous study (Bauernfeind & Zins, 2006). Since EBB is not as well tested as enjoyment, enjoyment will be used as well to assure that the hedonic component of web site satisfaction is not neglected in this study. Furthermore, these two dimensions will be tested as competing ones. The definition of enjoyment used in this study was inspired by van der Heijden (2004) and Davis, et al. (1992). According to them enjoyment is driven by intrinsic motivations and is the degree to which a system's use is personally enjoyable and fun.

Enjoyment is measured by the following items:
- ❖ This web site induces new ideas.
- ❖ This web site enhances my creativity.
- ❖ This web site arouses my imagination.

H4a Enjoyment positively influences the satisfaction with a personalised internet application.

Finally, the personal characteristics, attitude towards e-service and experience with the Internet are included in the research model. They are hypothesised to influence satisfaction and commitment either directly or indirectly.

3.2.6 Attitude towards e-service

Attitude was considered in a number of studies to serve as an influencing factor on satisfaction, performance or behavioural intention to use (e. g. Eroglu, et al., 2003, Shih, 2004, Suh and Han, 2002). Attitude can be the general attitude towards using the Internet or more specific towards information search on the web. Furthermore, the attitude towards the usage of the Internet to perform specific tasks (e.g. searching for a travel, buying a book) or the attitude towards e-shopping could be involved as well. In this study the attitude towards the usage of e-services is investigated. Attitude towards the usage of e-services is defined as the positive or negative attitude towards information acquiring via the WWW in general and for a specific product / service. Furthermore, the process of problem solving is covered as well meaning what is the user's attitude towards the e-service concerning a specific task.

The items used to measure the construct of attitude towards the e-service are:
❖ Information acquisition through the web is too time-consuming.
❖ Information acquisition via the web is useful.
❖ Using the web to solve this specific problem/task was a good idea.

The personal characteristic attitude towards the usage of e-services is hypothesised to have on the one hand a direct influence on satisfaction with the personalised system. On the other hand, attitude will influence how other constructs, i.e. ease of use, trust, usefulness and exploratory browsing are perceived.

H5a Attitude influences the satisfaction with a personalised internet application.

H5b   Attitude has an influence on the level of trust.

H5c   Attitude will influence exploratory browsing behaviour.

H5d   The more positive the attitude towards e-services or online information search is the more useful a personalised internet application will be perceived.

3.2.7 Experience

Experience with a system software, the web in general or a specific web site was considered in a number of studies (e.g. Igbaria and Iivari, 1995, Rodgers, et al., 2005, Wöber, et al., 2002, Gefen, 2000, Gefen and Straub, 2004). The Internet experience or familiarity in general could be considered or the familiarity (previous experience) with a particular interface could be the focus. In this study the internet familiarity in general is covered and additionally the familiarity with the particular personalised internet application is measured.

The questions used for the construct of experience / internet familiarity were:
* ❖ I feel familiar with the web site because of previous usage.
* ❖ How often do you use the WWW on average?
* ❖ Do you consider yourself as an experienced user of the WWW?

Again, experience can either serve as a direct influencer on the outcome or as an antecedent of other constructs or both, e.g. the influence of experience on trust was investigated by Riegelsberger et al. (2005). Wöber, et al. (2002) suggested that perceived ease of use and usefulness are influenced by experience. Furthermore, it is suggested that the level of experience exerts an influence on the attitude towards e-service or online information search. The higher the experience level the more favourable will be the attitude. All of the following hypotheses are suggested to be positive.

H6a   Experience influences the satisfaction with a personalised internet application.

H6b   Experience influences the perception of ease of use.

H6c   Experience has an influence on the level of trust.

H6d   Experience will influence exploratory browsing behaviour.

H6e   Experience will influence the attitude towards online information search and e-service.

Other personal characteristics than attitude and experience could be considered. Accessibility and facilitating conditions do not only mean physical access to the medium Internet. Access costs are a factor not to be neglected but there are also other aspects covered by accessibility, e.g. the possibility for disabled people to use a website. The importance of accessibility in the way of physical access or technical barriers is diminishing more and more in Western Europe. Bandwidths are improving continuously and more people gain access to the internet.

Involvement is another personal characteristic which could be considered when evaluating user satisfaction, systems' success or purchase intention via the Internet (e.g. Goldsmith, 2002, Hwang and Thorn, 1999, Palanisamy and Sushil, 2001, Blili et al., 1998, Lin and Shao, 2000). Involvement can be described twofold: first, the situational involvement when using the site, when interacting and searching for a particular service or product. Second, it means also product involvement, the general interest for a product or service. However, in this study, it is proposed to create a certain level of situational involvement by asking the study participants to perform a specific task on the personalised internet application.

3.2.8   Satisfaction

Finally, the two outcome criteria satisfaction and commitment are outlined. Satisfaction was defined by Oliver and Shankar et al. (1999; 2003) as "the perception of pleasurable fulfilment of a service". Satisfaction covers in this study the overall contentment with the personalised internet application after the user has experienced it.

The measures used for satisfaction were:
❖ the overall impression of the web site
❖ success of the information search process
❖ positive overall experience with the web site
❖ the quality of the recommendations / proposals was convincing
❖ the web site meets expectations

E-satisfaction was often researched in connection to e-loyalty, e.g. (Anderson & Srinivasan, 2003; Shankar et al., 2003). Loyalty is defined as a deep commitment to the provider (Oliver, 1999; Shankar et al., 2003). This study focuses not only on the aspect of intention to revisit the site but also on further recommendation to others. Therefore, the concept proposed is called commitment which is outlined in the next section.

The hypothesis emanating from satisfaction is that it has a positive influence on commitment.

> **H7** Satisfaction will positively influence commitment, with greater satisfaction leading to higher commitment.

3.2.9 Commitment

Commitment focuses on two aspects: the intention of the user to revisit the internet application and the willingness to recommend the web site to others (relatives, friends, colleagues).

The following items were used to measure this construct:
- ❖ I can recommend this web site.
- ❖ I will revisit this web site.
- ❖ I will use this web site more often in the future.

Literature review suggested the supposed relationships and influencing factors. Applied to the context of personalised internet applications, they are hypothetical. The goal of this study is to investigate these influences and to develop a valid model covering factors influencing satisfaction with personalised internet applications. The following chapter will outline the study methodology.