Beyond the User Interface: Towards User-Centred Design of Online Services

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Abstract. This paper presents an attempt to identify those economic factors relevant to design of online services, which shape long-term customer satisfaction, as well as customer loyalty and business relationship with the service vendor. Using user-based studies and expert-based evaluations and major economic factors were identified as *consumer needs*. Also typical technical components of online services have been identified and prioritized as *design elements,* also relevant to satisfying economic needs of consumers of online services. As a result of this study will be delivered: a catalogue of design elements, design guidelines and economics-oriented design methodology for online services.

Keywords: HCI, usability of online services, e-commerce, online customer behaviour, customer value.

1 Introduction and Background

A growing number of online services available in everyday life (in both business and in private contexts, like financial or travel services) make them interesting object of research and design. Successful design of an online service is not only the issue of providing good usability and smooth user-system interaction, but it is also the problem of delivering appropriate business value to the customer [7].

This issue has been raised by Benyon et al. [1], who discussed interesting interplay between two design streams: HCI and usability engineering on one side, and services marketing on the other; a role of users shifting from website users to conscious consumers-decisionmakers has been also discussed.

Demands of contemporary e-commerce and business require to include consumer behaviors and decisions as design drivers and – at the same time – as design constraints. Consumer needs should be converted into system attributes which delivers online service to the user, and its goal is to satisfy customer needs better than competition.

The design questions in this context are:

- how to identify customer needs and expected benefits?
- how to identify system attributes (service components) delivering previously identified economic benefits?
- how to deliver these benefits as system attributes (functions or components) to the user using the service website?
- how to use the service website to to stimulate customer loyalty, to build a profitable relationship with customers, and to deliver long-term economic value, matching customer needs and lifestyles?

Because usability is only a precondition to use the service, but perceived economic value of business relationship is nowadays presumed [3, 6, 8] to be the main attractor for regular using any specific online service, there is a need to expand existing methodology for online services design and to provide economics-relevant guidelines for designers of online services.

2   Current Approach to Design of Online Services

Current approach to design of online services is nowadays a mixture of e-commerce models, website design guidelines and relationship marketing principles [5, 6, 8].

Guidelines produced by HCI (Human-Computer Interaction) research are helpful in designing user interface and in improving website usability; however they are not covering other aspects affecting user behaviour – those aspects reaching "beyond the user interface" like information content, costs, attractiveness, prestige, lifestyles, which rather refer to economic criteria of consumer decision-making and long-term business relationships.

By now HCI has been seldom treating the *user as a consumer*, and the interactive system not only as a technical artifact, bus primarily *as a business platform* designed for satisfying customer needs (of mostly economic nature). Few HCI studies so far have adopted such a business perspective, apart from focusing on perceived value and worth [2] they were mainly relevant to designing e-commerce solutions and improving their usability with a focus on business performance.

As a result, nowadays HCI methodology is challenged to enhance its scope as to include also those elements of user-system interaction – a *business interaction*, in a sense – which may be useful in developing a better user experience not only when directly using the website, but also in a broader sense and in a longer term: as developing valuable business relationship between the customer and the online service vendor.

3   Methodology

3.1   Research Framework, Foundations and Assumptions

Foundations and assumptions for this research are originating from HCI domain as well as from service marketing literature, especially related to e-commerce, e-services and customer relationship management [3, 4, 6].

The importance of economic determinants of customer satisfaction, namely those related to factors "beyond the user interface" and plain usability, has been already discussed early studies on e-commerce [7].

Also former attempts to combine user needs with technical components that satisfy these needs provided foundations for quality management approach in improving the website as a whole (including quality of contents), not only quality of interaction.

Therefore a more economic approach, oriented on improving a service website towards delivering economic benefits for customer and enhancing value of relationship, was used to address the stimuli received by customer from both on-line channels (Internet, mobile interaction) and off-line channels (printed ads, press reviews, opinions of other customers).

As a research framework a model describing the gradual development of online services [10] was used to identify layers shaping different aspects of customer behaviour in on-line services (Table 1).

Table 1. Levels of service quality and levels of customer focus in development of online services [10]

Service quality focus	Customer focus
Value	Lifestyle
Relationship	Loyalty
Experience	Delight
Usability	Satisfaction
Functionality	Performance

Because customer needs cover various levels and various dimensions of expected service quality, they must have some specific technical realization on the specific website (for instance available as functions, buttons, catalogs, calculators, images, calendars, opinions, baskets, wish lists and other elements often available in e-commerce websites).

In general, technical realization of an online service covers two dimensions:

- analytical: system functionality and usability, to be *used* by a customer,
- emotional an affective: user experience, to be *perceived* by a customer.

As a result, a model describing interaction between the user and the service has been adopted, covering following technical components:

- business model, leading to customer attitudes and behaviors,
- transaction process, leading to repeated transactions,
- interaction layer, facilitating ordering and payment,
- visual design layer, enabling perception and manipulation on user interface elements.

Categories of user requirements in online service will be treated as consumer needs and they have to be identified using expert evaluation, case studies of real systems, and primarily – user-based testing of online services.

3.2   Research Procedure

Research procedure applied in this study was a sequence of several methods:

- expert evaluations: several examples of actual online services (financial, e-commerce and tourist information services) were analysed by team of e-commerce and usability experts in order to extract:

- o main requirements of users – with focus on economic needs,
- o main technical components of a service website – with focus on visual, transactional, business process and economic value elements;
- user-based testing: consisted of three parts, aimed on gathering user requirements and expectations as well as on validating experts' point of view:
  - o pre-test questionnaires and requirements workshop:
    - experienced users of online services (in three groups) were asked to fill in a paper questionnaire asking them to declare main categories of requirements and expectations when using on-line services, as well as difficulties experienced on familiar service websites; next these requirements were discussed with users, and grouped into several categories;
    - in another questionnaire task users were asked to compare main categories pairwise as to priorities for main requirements could be calculated;
  - o usability test of actual online service:
    - after requirements questionnaire and workshop users had to perform a specific task using a real online service (financial, e-commerce or tourist information); the tasks were designed in a way stimulating economic thinking – users had to decide which option from a given set is the most attractive;
  - o focus groups and post-test questionnaires :
    - after completing the task with a specific online service, users were asked to fill-in a post-test questionnaire, in which they were asked to identify perceived benefits and experienced difficulties falling into four categories:
      - economic value and relationship
      - business transaction process
      - interaction support
      - visual elements
- conceptual design based on the QFD methodology:
  - o selection and analysis of data gathered from users and experts using affinity diagrams, relationship matrices and prioritization techniques commonly used in the QFD (Quality Function Deployment) methodology, adapted to analyze and improve usability of websites [9].

The ultimate goal of this study was to gather enough data to form design guidelines aimed to address economic factors shaping user/customer behaviour not only in an operational dimension when using a specific service, but primarily in a long-term horizon, where *total value perceived by customer* as well as *perceived worth of relationship* determine customer loyalty and attitude to using a specific online service or an online brand.

4   Results

4.1   Expected Customer Benefits

Main groups of customer needs were identified, in more detail recently described in [11], with assigned following priorities:

Critical:	Attractive price (F1)
Important:	Security of access to service (F5) Sufficient information provided (F4)
Medium:	Convenient access to service (F3) Short time of website operation (F6) Low additional expenses (F2)
Less important:	Low physical workload (F7) Low mental workload (F8)
Marginal:	Benefits from marketing incentives (F9)

Priorities computed from user data (gathered from interactions with three types of online services) showed also that marketing incentives (like freebies, gadgets etc.) seem to have practically no influence on attracting users to use on-line services. Physical and mental workload also received surprisingly low priorities, however their meaning should be related not only to fatigue when operating the website, but also to more general convenience-related issues.

4.2 Technical Attributes of an Online Service

Post-test questionnaire delivered many qualitative data, which allowed to identify about 60 technical factors (service attributes, functions and components) which users declared as having impact on perceived quality in relation to website, service and to business relationship with a specific vendor.

These elements were classified into four layers with selected elements listed below:

V – Visual user interface layer
- easily readable screen elements,
- websites screen layout consistency,
- ongoing visual support (visual tips, flags, icons, maps etc).

I – Interaction layer
- easy navigation,
- automated operations,
- multiple views of the product.

P – Business process layer
- search support,
- comparing support,
- logical sequence of steps,
- confirmations in operations (instant feedback, feel of control),
- payment transaction flow,
- user profile, login etc.,
- tracking service progress (insight into the process).

R – Business relationship and economic value layer
- always attractive prices (attractive prices every day),
- preview of basket, preview of payment,
- product configuration customization,

- recommendations and customer opinions,
- choice of methods for placing orders,
- choice of methods for payment,
- choice of methods for delivery,
- fair terms of use,
- assurance about security, credibility and trust,
- related offers, special offers for special customers,
- customer programs,
- freebies and marketing incentives.

The section "**R**", covering business relationship and economic value layer was especially interesting due to the purpose of this study, and it contained more than 20 items declared by users as having impact not only on buying decisions but also on shaping long-term relationship with the service vendor.

4.3 Identifying Relationships

Data gathered from users were aggregated by experts and collected in a QFD matrix in order to search for possible relationships between user requirements and technical factors. Due to a relatively big amount of user requirements and technical components a preliminary selection was made, and the analysis based on a frequency of users declarations.

Priorities were calculated using data from pairwise comparisons from user studies, as well as expert estimations relevant to criticality of given technical factors to a business success of a hypothetic online service of a specific sort.

Taking into consideration relationships with identified consumer needs local priorities were computed within each category (**V**isual, **I**nteraction, **P**rocess, **R**elationship). Fig. 1. shows priorities for selected technical factors within the most interesting section, namely Relationship, covering components which shape economic value for customer. These priorities for technical factors have been computed using typical QFD sorting formula (see [9] for details), which combines importance of each identified customer requirement and relationship of this requirement with technical factors (like elements of service website), assigned to be "responsible" to satisfy each of customer requirements.

Results shown in Fig. 1 show that *presence of authentic customer recommendations* and *external evidences of credibility* gained top priorities. Next, customers appreciate *ability to check availability of service* (like amount of seats still left) as an important insight into the service process, with clearly written *conditions for guarantee and terms of use* for service and website. Remaining technical factors relevant to economic value are shown in Fig. 1., but will be not further discussed here.

Finally, all (exactly 64) technical factors have been classified according to QFD sorting formula, presenting local priorities within remaining three other categories (**V**isual, **I**nteraction and **P**rocess).

Because this study was intended as qualitative only, and pragmatically aimed to deliver design guidelines for developing online services (basing on user-based testing and expert aggregations of user data), no attempt was yet made to use statistical tools to prove generality of obtained results.
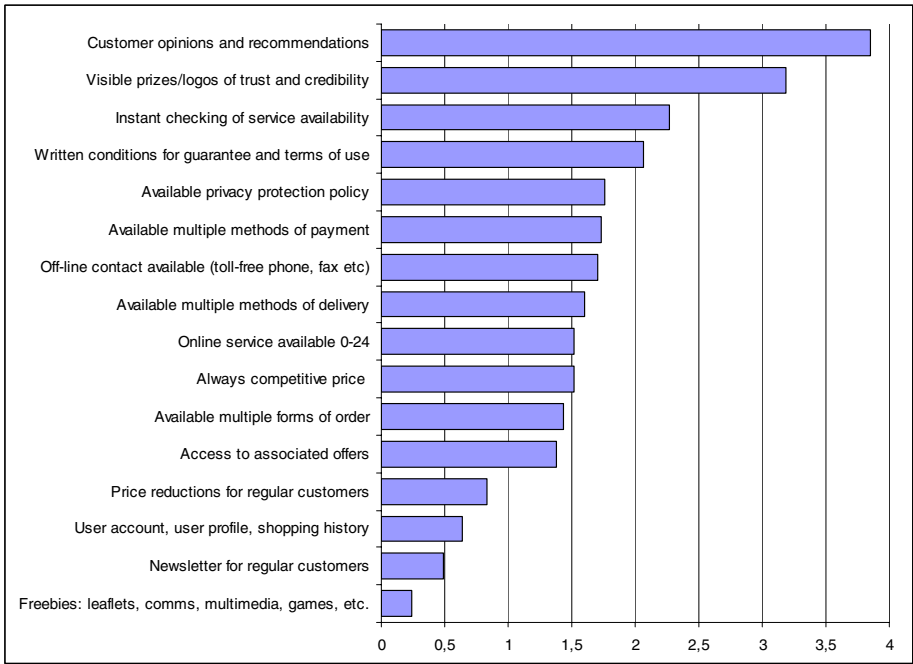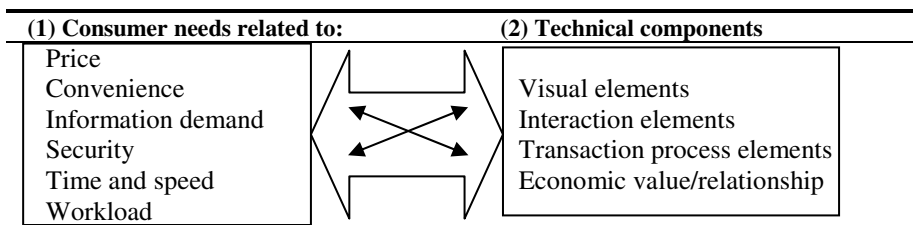
Fig. 1. Priorities for selected technical factors relevant to economic value and customer relationship in online services

Instead, a graphical analysis of relationships among user requirements (43 items finally grouped into 6 categories of customers needs) and technical factors (64 items, grouped into 4 categories V, I, P, R) was made. Because the data gathered from users were collected using three different types of online services, as usual in user-based testing user preferences and biases are bound to affect the raw results. For this reason expert analysis was also applied to aggregate the data – this brought surely some subjectivity to the assessments, but helped in extracting the data relevant to the context of online services of a specific type.

Table 2 shows that multiple relationships have been found among (1) identified categories of customer needs and (2) identified categories of technical components.

Table 2. Categories of consumer needs and related categories of technical components

(1) Consumer needs related to:		(2) Technical components
Price Convenience Information demand Security Time and speed Workload		Visual elements Interaction elements Transaction process elements Economic value/relationship

Classification of technical components is not yet finished, but intended result will be available as a catalogue of design elements ("online service primitives") which can be used to compose online services and service websites in a variety of business contexts.

Validation of this approach is planned as an user-based testing of online service prototypes, and observing users behaviour (in short-term as a willingness to buy and in long-term as a willingness to maintain a specific business relationship) will offer suggestions for developing a more general design methodology for online services.

4.4 Prospective Design Methodology

Prospective design methodology resulting from this project is aimed to address also business factors (beyond the user interface) by:

- relating specific user requirements (consumer needs),
- relating service attributes (technical components)

with economic values, perceived benefits and profitable business relationships.

It is also aimed to convert usability perspective in design an online service form website usability perspective to a wider perspective, clearly stating that a service website or a mobile device is only a delivery platforms for a more generic business solution – a specific online service.

4.5 Discussion

Presented approach although mostly qualitative, allowed to identify:

- 43 user requirements declared by a sample of online service users,
- 64 technical factors to be used when planning technical realization of a service website.

The items were grouped in several categories, helpful in developing design guidelines for online services.

Limitations and constrains of this study are at least the following:

- different types of online services were analysed together, basing on imperfect assumption that there is a common pattern of consumer behaviour underlying a general use of online services;
- users' behaviour and data were far from homogeneous, though bringing difficulties in averaging obtained data and extracting the most representative parts;
- currently, a lack of convenient visual notation for mapping 43 user requirements against 64 technical components makes presenting results difficult (large spreadsheets full of formulas), what reduces usability of eventual results.

5 Conclusions and Further Work

This approach, despite of advantages resulting from involving real users, has major limitations resulting from subjectivity of obtained data; users' declarations are always subjective as raw data, and even if aggregated by experts, they are still subject to experts' subjectivity in interpreting recorded observations.

Within this project further experiments with prototypes of online services are intended to prove if design guidelines stemming from this study are representative and valid enough for practical design contexts.

Because the shift in HCI design focus from the user interface, via service website to economic value and business relationship seems to be inevitable, this study – however full of limitations – is believed to present a novel attempt towards broadening HCI design methodology for design challenges of future online services.

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