

Advances In Usability Engineering

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Introduction

How many times have you wished the wash basin would be made in such a way so as not to spill water all around when you wash your hands? Or the doors in offices and public places made in ways which do not impede movement of individuals? Or take the case of one of the most ubiquitous device to date: the mobile phone. How easy is it to change its data storage card or use the media player feature to change tracks when browsing on the move?

More often than not, it is a challenge.

The reason is usually the same: Inadequate attention given to how the product will be used. Products are conceived, designed, built and deployed to serve specific purposes. A wash basin with an infra-red sensor has been designed to avoid using the hands to turn the tap on or off. It serves a hygienic purpose. However the placement of the sensor is what makes for a good or bad "hand-wash" experience.



In the picture to the left, the infra-red sensor (seen as two glowing points) is placed quite high up in the overall design, which leads to the necessity of placing one's hands higher than necessary leading to a messy spill-over.

Usability is the single most important factor on which acceptance of a product rests. A product designed with the intended user or users in mind and most importantly, adequate attention being given to answering the question: "How does the user want to use this product?" will result in the product being an usable product, doing what it is supposed to do, in the way that it is meant to do. Usability requirements for specific every-day tasks ought to be the driving factors for the different kinds of products that are needed to accomplish those tasks.

Usability Engineering

The International Standards Organization defines usability as “The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency & satisfaction in a specified context of use” [1].

Over the years the field of Usability has been known under names like CHI (Computer Human Interaction), HCI (Human Computer Interaction), UCD (User Centred Design), MMI (Man Machine Interface), HMI (Human Machine Interface), OMI (Operator Machine Interface), UID (User Interface Design), HF (Human Factors), Ergonomics etc [2].

Ongoing work and research indicated that more than technological factors, it was the psychological, social and cultural factors which were more dominant in impacting the everyday usability of products and applications [3].

This led to development of processes and methodologies to approach the problem in a systematic manner.

Usability Engineering is the discipline which employs the necessary processes and methodologies to ensure that products designed using the processes and methodologies achieve a high degree of usability.

It is a set of activities that ideally take place throughout the lifecycle of the product, with significant activities happening at the early stages before any interfaces to the user have even been designed [2].

Developing sound usability engineering practices requires drawing on expertise from the fields of anthropology and cognitive and educational psychology apart from computer science and other engineering fields.

Usability engineering began to emerge as a distinct area of professional practice in mid-to-late 1980's [4].

Why is it needed?

With a proliferation of different devices and advancements in technology leading to multitude of features and functionalities, keeping the user attached and loyal to the brand involves understanding what the user wants to achieve with the product. This necessitates a methodical, process driven approach of understanding the usability of the product.

There are numerous instances of products and applications failing simply because of the inadequate attention being given to their usability aspects.

- Failure of a particular e-commerce site of a clothing retailer in the US because *“shoppers experienced great difficulty navigating through the site, locating items of interest and finalizing purchases”*. This after an investment of 120 million dollars [3].
- A leading Indian telecom service provider introduced a Mobile Value Added service on topical issues like entertainment, sports and current affairs. The company observed that there was a significant response from around 60% users at the activation stage but a very poor response of only 5% at the subsequent usage stage, a dramatic reduction of 55%. The reasons were attributed to inadequate usability studies by the provider [3].
- My new mobile is lumbered with a bewildering array of unnecessary features aimed at idiots. This comment in the Guardian was in reference to the features of a mobile phone manufactured by a leading mobile handset manufacturer. The phone had touch-sensitive buttons that either refused to work, or leapt into action by the slightest touch. One such button also terminated calls, so it was easy to cut people off merely by holding the phone against the ear. [5].
- A bank customer in Norway lost a hundred thousand dollars when she inadvertently entered an additional digit in the account number field while transferring funds online to her daughter. The user interface design did not prevent this from happening. Also, the bank’s usability studies did not take into consideration the normal human tendency to be more careful while entering the digits one-by-one rather than to carefully read the subsequent dialog shown to the user for confirming the transaction [6].
- The author experienced at first hand the impact of inadequate usability studies and tests prior to launching a new software application. The State Road Transport Corporation in suburban Mumbai introduced a new ticket reservation system which did not take into consideration the boarding location of the passenger. This information is a passenger input field on a paper form which is filled in manually at the reservation desk, but is missing in the reservation software making it well- nigh impossible to use the system as intended. The author had to resort to alternate means of travel on that day.

Challenges

One of the key challenges to widespread adoption has been the awareness about this field, which had been largely confined to academia for a while before it began to be adopted by the industry. A general lack of awareness was observed in corporations, especially at the senior management level of the need and necessity of putting the user first.

The ever dynamic landscape of changing work and employment patterns accompanied by technological advancements creates its own set of challenges especially in multi-location projects which are quite common especially when development work is outsourced for commercial considerations. Although the preferred software outsourcing destinations have not had strong traditions in the areas of human-computer interaction or usability studies, customers and clients are open to offshore usability and creative design services as well. This has raised concerns, with time, skills and communication being listed as the key factors which could be impacted [3, 7].

Apart from budgetary concerns due to the perceived high cost and complexity of usability methods, the fact that cost savings from increased usability would not show up until after the release of the product, also resulted in poor adaptation [2].

The present generation of informational devices are most often used in low-attention span environments. Mobile phones are the best example of such devices. Device evolution is not only progressing towards the “more to be accomplished on one device” paradigm, but is also moving towards devices which perform specific tasks on the go for example the e-readers like the Kindle, or portable media players which have their unique usability engineering requirements.

Changing Times

There have been significant changes with regards to usability engineering in recent years. Availability of statistical information indicating losses due to defects detected after product shipments which could have been fixed earlier in the life cycle are leading to increased awareness amongst corporations and governments alike as to the importance of incorporating usability practices from the outset. The most important change has been to incorporate the practices at this stage as the pain areas are particularly difficult to rectify in the later stages. Time itself is on the side of increasing the perceived need for usability as user interface design and customer service will probably generate more added values for companies with interfaces being a major factor to differentiate products in an otherwise homogenous market [2].

Usability is getting the attention it deserves and is now being accepted as a primary, un-separable and integrated part of product or software application design process.

- The UK Governments annual review of the local government websites sets a goal for those sites to be 'useful, usable and used' [3]
- The Chief Information Officer of the host city's governing municipal body was in attendance at the conference mentioned in [3], indicating the increasing awareness of this field at government level.
- The Boeing Company's 787 Dreamliner program included Human Factors as an integral aspect for all design decisions from initial configuration concepts including general airplane layout and provisioning, to the final design stages which encompasses design for production, operational use and serviceability in the field [8]
- Usability (User Experience Specialist) has been adjudged one of the 30 top careers recently [3]
- The success stories of the iPhone is primarily due to it's groundbreaking emphasis on usability. Tests conducted[10] were un-equivocal in proving the high degree of usability of the iPhone with users being "twice as fast doing specific tasks on the iPhone". These tests were conducted with a view to analyze the devices' usability out-of-the-box and were devised to not let learnability affect the results. The study noted that an important reason for the high usability score of the iPhone was its simplicity of design.



Tested against competitive phone's, the single button on the front panel and the easier to find & use power button are some of the salient points which the study found contributing to the success.

Recent Developments

The methodologies and practices followed by usability engineers have evolved over a period of time. The usability engineering life cycle typically employs the following stages, from study of the intended user and setting usability goals including performing a financial impact analysis to the various design approaches of parallel and participatory design, prototyping and collecting feedback from field use [2].

“Who will use this product? How will he or she use it? Will using it in a particular way cause hindrances to normal behaviour? How much of an additional strain will be effected on the user, especially in cases involving situations which could turn potentially life threatening?” These are some of the questions that the professionals in this field deal with during the course of analyzing the usability of the product or a software application.

Advances in technology are helping usability professionals to better understand the mind of the user. Eye-tracking techniques can provide meaningful insights to help them understand why the user interacted with the interface in a particular way and captures details such as a participant’s eye movements and fixation points across the screen [3].

In order to foster usability engineering practices in corporations, business schools like the Copenhagen Business School and Bentley University, Boston are now introducing appropriate usability studies as part of the management education curriculum [3].

Businesses are recognizing the need for incorporating better usability engineering practices within their organizations, especially while working on offshore projects. Emphasis is placed on minimizing the gaps between the stakeholders. Sharing the results of the usability studies or planning for the offshore team to participate remotely in the usability studies are some of the approaches being adopted. It is also important that the offshore teams conduct their own usability research on the domain. Other ideas mooted include establishment of usability labs capable of projecting test sessions to offshore locations [3, 7].

Usability is a measurable quantity. Some of the known methods of measuring usability are heuristic evaluation and the GOMS technique. Work has been done recently on measuring usability in object oriented systems as a function of the feedback responses and other parameters in the software application. The work evaluated the various factors like the system status feedback, the undo and cancel features, form validations and alert facilities amongst others and arrived at a measurement mechanism for usability [3].

A thesis on use of mobile phones [9] brings out the contextual aspect of usability studies and makes a design suggestion to increase the usability of individual features of the mobile phone.

Advances in usability engineering point to the importance of responding quickly to changing applications and technologies. A changing environment demands a change in usability and design with traditional methods being unsuitable to adapt to the changes.

The perspective of Contextual Usability states that what are routinely edited out as distractions in a laboratory environment must be at the centre of design studies and test in the outside world.

Present day systems and applications have a broader user base, more and different users, and more demanding user expectations placed upon them.

Accordingly the traditional laboratory based usability testing approaches are difficult to use especially while conducting usability studies or tests of requirement factors like attention and ambience. This makes the real context of use important, and the real context of use is not the laboratory but the outside world.

The mobile phone is a product which is used in different contexts and therefore must be flexible to use. It is also used in different social environments and has varying needs and goals which are quite subjective to the user. Thus one suggestion is to modularize the mobile phone. The user selects only those functions or modules which he or she needs. This customization will lead to higher usability and value for money.

Usability Engineering at L&T Infotech

L&T Infotech has successfully applied the principles of usability engineering to roll out an integrated end to end Software Project Life Cycle Management system which provides a single interface to all software engineering practices required for project execution. The design team relied on Participatory Design principles to involve the intended users at early stages in the life cycle to minimize the subsequent usability pain areas.

L&T Infotech, with a view to provide end-to-end solution to mobile handset customers has entered into collaborative ventures with leading user experience design and strategy consulting organizations. Such a relationship allows L&T Infotech to merge its rich domain skills with the niche design skills of the said organizations.

The consulting organizations are involved in gathering pivotal insights into customers behavior which enables L&T Infotech to develop applications for mobile handsets which are intuitively usable and enable richer user experiences.

Conclusion

With increasing awareness and better adoption of existing and newer methodologies and processes, usability engineering will allow creation of better interfaces by projecting the myriad features and functionalities of present day complex products in a way which are easy to use and which will allow the user to derive maximum benefits from them.

Abbreviations and Acronyms

GOMS	Goals Operators Methods and Selection

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About the author



Mr. Suyog Vaidya is a Sr. Project Manager in the Mobile Handset Practice of the Product Engineering Services Business Unit of Larsen and Toubro Infotech in Navi Mumbai, India. He has been working in the fields of healthcare, telecom and mobile devices for the past thirteen years, eleven of which have been with L&T Infotech. He is a member of the IEEE.

About L&T Infotech

Larsen & Toubro Infotech Ltd. (L&T Infotech), one of the fastest growing IT Services companies, is ranked 5th globally among the Best IT Services Providers by Global Media Services in 2009, ranked 11th by NASSCOM among the top software and services exporters from India and also ranked among the 'Leaders' category in the prestigious Global 100 list released by the International Association of Outsourcing Professionals (IAOP). A wholly-owned subsidiary of USD 8.5 billion Larsen & Toubro, India's largest technology-driven engineering organization, L&T Infotech is differentiated by the unique Business-to-IT Connect, which is a result of our rich corporate heritage.

We offer comprehensive, end-to-end software solutions and services in the following industry verticals: Banking & Financial Services; Insurance; Energy & Petrochemicals; Manufacturing (Consumer Packaged Goods, High-tech, Industrial Products, Automotive, Chemicals & Process, Media & Entertainment, Pharma, Retail and Logistics); and Product Engineering Services (Telecom).

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