IMPROVING USER SATISFACTION IN THE POST-IMPLEMENTATION PHASE OF A LARGE-SCALE INFORMATION SYSTEM

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Abstract: This paper presents a framework for identifying and improving user satisfaction for implemented information systems. Frequently, the post-implementation phase of a systems lifecycle is ignored and problems go undetected, which leads to user dissatisfaction. A poorly designed system can become a barrier for users and often they become reluctant to tolerate and use the system. If users resist working with the technology, the potential for the system to generate significant organisational performance gains can be lost, rendering the introduced system a costly mistake. This paper attempts to refine usability beyond just human-computer interaction (HCI). It introduces the Post-Implementation, Usability Synergy (PIUS) framework, which focuses on six different elements, including: training, functionality, reliability, working environment and interfacing, all centred on the actual users of the system, with the aim to enhance user satisfaction towards the new system.

1 INTRODUCTION

A large-scale information system can enable an organisation to dramatically improve their business model, change internal structures and over time increase profit margins. Due to this, many organisations around the world have invested a considerable amount of money in setting up these systems (Lucas, 2005; Hawking & Stein, 2002). Although information systems (IS) can bring a competitive advantage to organisations, the high failure rate in deploying such systems is a major worry. Many organisations have suffered from ineffective IS, for instance: Whirlpool, Irish Health Authority, Allied Waste Industry, Hershey Foods, Boeing, Mobile Europe, Applied Materials, Waste Management Inc, Kellogg's, Irish Prison Service, Irish League of Credit Unions and Nestlé (Weston, 2001; Yu, 2005). Past research on advanced IT deployment identifies the post-implementation phase as the critical period during which the new system becomes embedded in the host organisation. Conducting a post-implementation review (PIR) on the system during this critical period can highlight usability flaws and system weaknesses. Repairing these flaws can ultimately limit the chances of a large-scale system failure (Halpin, 2003; Kueng, 2002; Nielsen et al., 2001). Organisations have a tendency to push people and process related issues to the bottom of the list due to time and cost overruns, many expecting users to find the new system easy to learn. Unfortunately, this is usually an over optimistic hypothesis. The problems causing large-scale IS failure after a system has gone 'live' fall into multiple categories, including inadequate user training, poor system reliability, inaccurate business functionality and shoddily designed user interfaces (Carroll & Carrithers, 1984; Wixon et al., 1990). A number of prominently publicised system failures have highlighted the difficulties involved particularly in the post-implementation phase of an IS. For example, in 1997 the Irish Health Authority (IHA) invested in the Personnel, Payroll and Related Systems (PPARS) project to manage the development and implementation of a fully integrated Human Resource Management system. Originally, the PPARS project was due to cost €8.8 million. However in 2007, the PPARS project has yet to be fully integrated, largely because the system was complicated to use, lacked general training and failed to do what it was intended. It is estimated it will cost over €231 million, 25 times the original estimate to solve these problems (Hunter, 2005; McGee, 2005; Kennedy, 2005, PPARS, 2005;

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INBITE, 2005; Irish Health, 2007). Key reasons for such failures is information systems development (ISD) methodologies concern themselves primarily with pre-implementation activities, rather than the extended post-implementation phase and often exclude any usability evaluations or users involvement after the system goes 'live'.

There is a growing need for research, which endeavours to develop a framework that captures and aggregates usability issues in the post-implementation phase of large-scale IS. This paper attempts to bridge a significant gap in ISD research and endeavours to synthesise a framework that will both examine and indicate specific usability issues that may arise within the post-implementation phase of an IS.

2 POST-IMPLEMENTATION

The post-implementation phase (PIP) occurs after the system has been developed and has gone live. By conducting an evaluation after the system during this stage IT payoffs can be realised against their original objectives and corrective action can be performed where necessary. As a consequence of this intervention, the PIP can serve extremely useful. It can allow the IS managers gain an understanding of the new system and can reduce the chances of expensive failures. A well planned and executed PIR can assist organisations to address needed changes in the systems architecture and correct any errors in the system that went unnoticed in the development stage, such as an inadequately designed interface (Nicolaou, 2003; Woodings & Everett, 1999). Including the users in the evaluation of the system throughout the PIP can determine whether the system is easy to use, easy to manage and easy to learn. Despite the huge importance of this stage, ISD methodologies largely ignore this critical phase of the development life-cycle. Past research proves that very few organisations review their system after it goes live often expecting users to find the new system easy to learn. Regrettably, this is usually an over optimistic assumption (Wixon et al., 1990; Devaraj & Babu, 2004; Palvia et al., 2001; Nicolaou, 2004; Yu, 2005; Nicolaou, 2003; Woodings & Everett, 1999; Tallon et al., 2001).

3 USABILITY

The International Standardization Organization (ISO) established a usability standard that can be defined as the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction (ISO-9241, 1998). Usability is multidimensional encompassing user attitudes, learn-ability, effectiveness and flexibility towards the system or product with the aim to make users quality of life better (John, 1996; Shneiderman, 1998). Systems with high usability have 'natural' interfaces, are easy to learn, easy to use and are associated with many positive outcomes, such as a reduction in errors, a positive user attitude towards the system and increased system use, therefore gaining greater productivity for the company (Fruhling et al., 2005; Shang & Seddon, 2000). While organisations have spent millions implementing large-scale IS, research indicates that potential users often unable to use the new system, and often revert back to previous methods or use the system incorrectly. Users of IS that have low or poor usability often get to know and use 20–30% of the available features, which leads to high productivity slumps, huge loss of profits for the organisation, low user morale and often an expensive, unused IS (Nielsen & Coyle, 2001). Yet, organisations still overlook the importance of usability particularly in the PIP of the system development life cycle (Calisir & Calisir, 2003).

4 CONCEPTUAL FRAMEWORK

A comprehensive conceptual framework is needed to address a wide range of usability issues in the extended PIP of a large-scale IS. Figure 1 is a conceptual post-implementation, usability framework developed by the author. This framework is called The Post-Implementation Usability Synergy (PIUS) framework. It is a working theoretical framework that is to be informed by a future pilot study. The key practical implication of this framework is to enhance the user experience by identifying any usability issues with the IS. The framework contains six different parts but the combination of all these elements will improve user satisfaction with the new system. The PIUS framework acts as a synergy. It contains six different parts but operates as one. Each element has an importance, but combining all the elements together, similar to a gestalt, will be greater than the sum of their individual effects. The PIUS framework was designed to identify areas of user satisfaction with a new large-scale IS, from the users point of view. The framework comprises of the six components, these include: user interface, business functionality, system

reliability work practices, and support and training. All these components are built around the users of the system. By overlooking one of these elements, it would have a knock-on affect and reduce the user satisfaction toward the system. If users were satisfied with all of these elements, the usability synergy was complete and user satisfaction would be created.

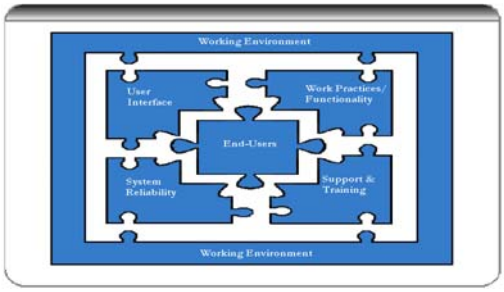

Fig. 1: The PIUS Framework.

End-Users. The purpose of the PIUS framework is to help identify areas of user satisfaction or dissatisfaction users are having with an IS. The best way to achieve these areas is to know exactly what the user wants and needs, this can be accomplished by working closely with the user and establishing which area(s) of the system s/he is having most trouble with. The user is the person for who will be working first-hand with the system. If the user is having difficulties with a certain part of the system, satisfaction with the system will inevitably be low. It is essential that the system is reviewed in the post-implementation phase from the user's point of view, to uncover any issues with the system. By not considering the thoughts and opinions of the user in the PIP it is impossible to establish whether the system has an adequate level of reliability, interfacing, functionality, or training supplied to ensure the end- user can work effectively and efficiently with the new system. For an organisation trying to successfully implement an IS, the user (employee) is the most important piece. If they are having difficulties with any aspect of the system user satisfaction will be low and the PIUS framework will not able to piece together properly. The synergy will be incomplete until all issues have been resolved.

Work Practices/Functionality. The business functionality of an IS indicates the features and capabilities the system comprises of, and can be defined as 'the requirements necessary to perform the specific tasks which the users require it to do in the operational situation'. The functionality of a large-scale IS can be categorised into two different components, these include:

- Meeting business requirements
- Meeting user's requirements

Organisations need to have clear and unambiguous understanding of the business objectives before the system is designed, to ensure that the correct functionality is obtained. Failing to meet the requirements of the business can cause a great deal frustration for the people trying to work with the system. A system that is designed with limited functionality or high inconsistency can cause problems for the user and frequently is the main cause for users rejecting to use the system entirely. The IS should provide the right information to the right person, at an accurate time. If the functionality is inadequate, it does not matter how well the interface is designed, ultimately the system will create low user morale and a decrease in productivity. If the functionality is inadequate, regardless on how well the interface is designed or how reliable the software is, eventually the system will create low user confidence. If this occurs, the PIUS framework will be incomplete and the elements will not piece together. User satisfaction will remain low until the functionality is fixed.

System Reliability. The reliability of a product is defined as 'the measure of its ability to perform its function when required, for a specified time, in a particular environment'. A reliable IS must support the needs of the user in a simple, fast and consistent way. A reliable system must be able to protect against unauthorized access to its physical and logical components. The reliability of an IS can be categorised into three different areas, these include:

- The systems software
- The systems hardware
- The systems communications (Networks)

A reliable system is one that is capable of operating without material error, fault, or failure during a specified period in a specified environment. If a user cannot access the system or cannot display data s/he requires, it does not matter how well developed the systems is users will reject using it. For user satisfaction to be achieved IS reliability must be developed effectively. If the system does not perform as expected, it will cause problems for the person who is trying to carry out their work. Users get very frustrated when the system fails and they have to redo any work they have already completed. A system with poor reliability can reduce a user's satisfaction dramatically, and can affect the work practices of the user. If this component of the PIUS framework is missing, the user and the work practices will be also be affected, resulting in a dissatisfied user and a poor system.

User Interface. As far as the user is concerned, the interface is the product, it is the part of the system, which the user sees, hears and communicates with. An interface should provide the user with an easy and flexible interaction with the system therefore, preventing users from becoming disorientated, and assisting them carry out their working objectives effectively.

The design of the interface must consider the physical design of the workplace (ergonomics) and the support documentation (training and support). Since the functionality of systems is made available through its user interface, its design has a huge influence on the usability of the system. The interface must be developed according to the needs of the users and the business, and should be designed after all the business process have been finalised. A good interface requires deep understanding of the work practices in the context of the tasks that the IS will help carry out. It is irrelevant how well engineered the software code or how sophisticated the hardware is; a bad interface can ruin an otherwise excellent system. Ultimately, a systems interface can have a huge bearing on the training, the work practices and the user. If this component is poor or limited the overall PIUS framework will not be complete and will affect the user's ability to learn (training) and to carry out their work appropriately.

Support and Training. Effective support and training is crucial when users are being introduced to a new system. New users of high-function application systems can become frustrated and confused by the errors they make in the early stages of learning. Lack of user training and a failure to fully comprehend how the IS works, is a major reason why newly implemented systems fail. A systems support is made up of documentation, both online and physical manuals and technical support, offered by individuals who are experts in the system architecture. If the support and training component is missing the PIUS framework will be significantly be hampered. Poor support and training will have a knock on affect and can lead to an unproductive and unsatisfied user. Training should provide the user with the knowledge required to do their job, if training is inadequate the user would not be able to do their job correctly.

Working Environment / Ergonomics. A large number of factors play a role in ergonomics; these include body posture and movement, environmental factors, information and operations as well as tasks and jobs. Ergonomics can contribute to the solution of a large number of social problems, such as comfort, health and safety and user performance within the environment of the system. The goals of ergonomics range from the basic aim of making work safe through increasing human efficiency, to the purpose of creating human well-being. A well-designed environment can produce improved productivity, efficiency, acceptance and contentment for the user. The aim of ergonomics is to achieve an increase in user satisfaction by making their working life secure. Despite, the importance of human safety in the workplace, organisations fail to recognise how closely it relates to their success. Users who find the environment they are working in too uncomfortable will have low job satisfaction, and will have poor productivity disregarding how easy the IS is to use or how reliable it is.

5 CONCLUSIONS

The PIR and usability evaluations are critical activities within the ISD life cycle, as far as information evaluation is concerned. Forcing users to use and accept systems only leads to failure or user resistance (Nielsen & Coyle, 2001; Woodings & Everett, 1999; Willcocks et al., 1997; Ardito et al., 2004). This paper introduces a conceptual framework that will ensure ultimate system usability for the users it was designed to assist. The objective of the PIUS framework is to achieve ultimate usability for the user and the best way to produce a usable system is to know exactly what the user wants and needs. Working closely with the user and establishing which area or areas of the system s/he is having difficulty with can accomplish this. This framework has been specially designed for systems that have recently been introduced to the workplace and places the user at the centre of the evaluation. The framework should be incorporated into a post-implementation evaluation of the new large-scale IS. For user satisfaction to be achieved the organisation must develop a suitable environment for each user. Only when each piece of a jigsaw is fitted together properly can a jigsaw be deemed finished. The PIUS Framework is no different. For example, if the users are having difficulties working with the interface, no matter how reliable or functional the system is, the PIUS framework will not piece together entirely. Only when each component of the PIUS framework is pieced together properly can the large-scale IS achieve ultimate usability for the users. The PIUS framework is based on current research in the area of usability and post-implementation. However, as little work has been done to validate these issues in a

holistic way, the next stage is to carry out field research to verify the various elements of the PIUS framework and to determine the relative importance of the various pieces in addressing post-implementation usability comprehensively.

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