IMPROVING THE PROCUREMENT PROCESS: HUMANIZING ACCOUNTANTS WITH A HUMAN FACTORS EDUCATION

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Abstract

The purposes of this paper are to show how the development and procurement processes are affected by accountants and to consider what human factors knowledge accountants should have to facilitate the acquisition of systems that will make a genuine contribution and organizational improvement. Many systems are procured that do not provide a significant overall benefit to the acquiring organization. The process of acquiring significant systems almost always involves financial specialists who, by their training, focus on value for money. Findings of a study of accounting syllabi are reported with respect to human factors content. While accountants may have a large input into the decision making process with respect to system design and procurement, their awareness of all of the relevant human factors issues is limited. This is likely to negatively affect their decision-making capabilities. One body within the accounting profession that is redressing the balance is identified. Its use of the concept of human information processor is briefly described. Ways to further improve the training of accountants so that human factors practice can be better accommodated are considered.

Keywords: Software selection, IS investment, value analysis, user friendliness, user orientation, budgets, user satisfaction.

1. BACKGROUND

System design decisions, including those relating to human factors, are made in an economic context. A range of specialists, which includes accountants, has a role in the selection of systems and system options. In larger organizations, this role is exercised through the IT and project steering committees where systems are prioritized and approaches to selection and design are determined. While Earl (1989) identifies four types of steering committee, their role is always along these lines. In smaller organizations, the role of accountants in system design is traditionally exercised through the control of finance, but without the moderation of formal committee structures. In both cases, their focus is on making the best use of funds available through the provision of IT services to users. One approach to this, from a financial point of view, is to identify the return on investment. When the focus is on throughput acceleration (Prince 1996) to increase turnover, or reduced staffing to reduce costs, return on investment is perceived to be relatively easy to measure and can be said to be objective. Thus procurement and design decisions are affected and moderated by financial considerations. In such an environment, it may be difficult to make a case for purchasing a more expensive system that takes into account relevant human factors issues. Even in larger organizations, where the relevant committees exist and have members with a formal IT background, there may not be the necessary human factors awareness (Kirby et al. 1995) to make what human factors specialists would see as the right decision. An extreme example of this can be seen in the report by Bourn (1991), in which 25 mainframe-based administration and logistics systems in the UK Ministry of Defense were reviewed. Following implementation, one of these systems had 6,600 user requests for change. While this may

not be exclusively a human factors issue, it is probable that appropriate human factors methods were not applied in requirements analysis or in design. Had they been, then the number of change requests would have been lower and user satisfaction would have been higher.

The appointment of human factors specialists is still rare and the IT education of accountants tends to focus on traditional IT issues. While the purchase of off-the-shelf systems is clearly part of the procurement process, so is system design. A bespoke system has to be specified as part of its procurement prior to the design process. Global investment in information systems is enormous, yet there does not appear to be any correlation with organizational investment in IT and organizational success (Landauer 1995). Formal design methodologies such as SSADM[1] (Meldrum, Legk and Guy 1993) and soft systems methods (e.g., soft systems methodology, Checkland 1981; Checkland and Scholes 1990) require user involvement in the analysis of requirements. That the effectiveness of user involvement in determining functional requirements may depend on a number of factors, including the complexity of the requirements, skills of the systems analysts, appropriateness of the methods used, etc., has been known for some time (Davis and Olson 1985). In the purchasing/procurement process, apart from functional and quality considerations, there are financial considerations. Budgets are set, variances monitored, and a return on investment is required. In both cost and profit driven =, there will be a tendency for selection to be based on the greatest amount of function for the lowest possible cost. Where two functionally equivalent systems are =, then there will be a tendency to choose the cheapest. The arithmetic of bottom line calculations provides an impartial method for system selection. It would not be fair to suggest that cost is the only consideration; quality is also taken into account. However, quality is often defined in terms of reliability, availability, appropriate standards applied, etc., and not in measurable human factors terms that stem from approaches such as the mature but yet to be widely established approach of usability engineering (Whiteside, Bennett, and Holtzblatt 1989; Whiteside and Wixon 1987). That usability engineering is not more widely used is both unfortunate and surprising. Its reductionist approach to human factors issues makes it suitable for communication between human factors specialists and other who are interested in the wider effects of systems such as senior managers and financial specialists.

The authors suggest that a dual focus on function and cost is inadequate, that the typical definition of quality is also inadequate, *and* that human factors should be given greater weight. In order for this to take place, it is necessary for system designers to take human factors into account in the analysis and design of systems. However, effort by designers is not sufficient. It is known that the development of a highly usable system has increased costs (Johnson 1995), but that there is a greater chance of system success when human factors are fully considered. That human factors has a valuable role to play needs to be imparted to all those involved in purchase and procurement: users, technicians, accountants, and all branches of management.

Johnson applies utility, a concept he borrows from micro economics, to describe how it *may* be possible to motivate managers to pay for human factors effort. However, this requires a process of education. He reports that few companies devote resources to usability engineering (Dillon, Sweeney and Maquire 1993) and that there is little commercial confidence in human-computer interaction (HCI) as a discipline (Bellotti 1988). While there are some reports that this situation is improving (O'Connell 1996), it is worth noting that, while many system designers lack significant human factors training (Kirby et al. 1995), there are very few posts advertised for human factors specialists. Johnson goes on to describe the circular nature of the problem: that while there is little perceived benefit from human factors input, little will be invested in it, so insufficient benefits will be visible to justify future investment. The argument is further developed by considering decision theory in the face of (financial) risk, i.e., where an investment is definitely required but the return is uncertain. Actual and perceived risk can be shifted by legislation. Johnson quotes European Union legislation (European Council directive 90/270/EEC) as an example of legislation that aims to improve usability. Where such legislation exists, then decision-makers are educated as to the benefits of human factors effort and simultaneously made aware of the penalties of not adequately providing resources for human factors. However, just being aware of standards does not mean that good design or system selection will be the result (O'Connell 1996).

Johnson summarizes his findings by focusing on what the field of HCI must do in order to increase the adoption of their skills and services. Based on an understanding of the decision making processes of purchasers faced with risky decisions, HCI specialists could

[1]Structured Systems Analysis and Design Methodology.

(1) develop low cost techniques for introducing human factors into the design process. Reducing costs has the effect of reducing risk *and* reducing the benefit required to gain a positive payback.

(2) develop quality assessment procedures that will support outcome prediction and allow appropriate methods to be selected.

(3) gain an understanding of the organizational issues that impede the adoption of human factors methods so that these issues can be circumvented or solved.

Nielsen (1995) considers reasons for the failure of human factors methods to be adopted. One issue is the perceptions held of the various methods. Where a method has been difficult to use, it can be difficult to overcome this, even when the method is improved. Nielsen concludes that "aggressive advocacy" is needed if "technology transfer" in this domain is to take place. Evidence such as that presented by Karat (1990) needs to be more widely disseminated. That there is potential for a 200% return on investment in human factors approaches, such as iterative usability testing, should be more widely known. It is difficult to believe that such persuasive arguments would be strongly resisted if presented well.

This paper considers a complementary approach, and one that follows from both Johnson's and Nielsen's conclusions. While it is undoubtedly beneficial for human factors specialists to understand the decision making process as described by Johnson, it would also be helpful if decision makers such as accountants could understand something of human factors. The professional and academic links of the authors have lead them to focus on accountants and so the focus of this paper is on identifying the human factors knowledge that accountants have and identifying useful additions to that knowledge. It is also the case that the traditional steering committee approach adopted by larger organizations places financial specialists in a key decision making role with regard to standards, methods, and the selection of system options. As such it would be appropriate if human factors knowledge could be used in policy making in these areas.

2. CURRENT HUMAN FACTORS TRAINING FOR ACCOUNTANTS

Most training in human factors for IT is directed toward the *designers* of system artefacts. It is obviously right that designers have an understanding of human factors that is both broad and deep. Without this understanding products will be designed that do not suit their users, with potentially hazardous consequences. However, while designers are fundamental to the creation of objects and systems they are *not* fundamental to the purchasing or procurement process. This is true for the acquisition of both custom-made and off-the-shelf products. A consequence of this is that many of the decision makers with respect to system acquisition may not be aware of the importance of human factors to overall system success.

Data to support this can be found in a range of syllabi for accountants and others in decision making positions, e.g., marketing and human resources (Scown 1995). The most significant syllabi here are those for accountants belonging to the following professional bodies: AAT, CACA, ICA, and CIMA.[2] Typically, these consider the role of the accountant in the procurement process as being a member of the IT steering committee. In this role, they are required to:

(1) ensure the most cost effective purchasing decisions are made;
(2) be aware of the range of design methodologies;
(3) prioritize systems for procurement; and
(4) evaluate systems.

That any facet of the role could include human factors input is not reflected in the syllabi. Typically, it is considered enough for an accountant to know tha (1) users should be consulted and (2) user friendly systems should be bought. Any human factors

[2]These abbreviations are Association of Accounting Technicians (AAT), Chartered Association of Certified Accountants (CACA, although this body also on occasion uses the abbreviation ACCA), Institute of Chartered Accountants in England and Wales (ICA), and Chartered Institute of Management Accountants (CIMA).

specialist would regard the treatment given to each of these areas as perfunctory. For example, "consulting users" is almost exclusively taken to mean that system designers should *ask* users what they need. In human factors, we are aware that this strategy for determining requirements only works when requirements are both simple and straightforward. In all other cases it may be beneficial to apply methods such as prototyping, soft systems analysis, task analysis, etc.

It is proposed that syllabi for accountants should be changed to include sufficient content for the non-IT professional to be able to define appropriate usability requirements and to determine if a system offered to them meets those requirements. In reviewing syllabi, it has been seen that much is made of traditional system design issues (AAT, 1997; ACCA 1997; Eardley et al. 1994; ICA 1997). For example, the previous CIMA Information Technology Management syllabus contained detailed sections on SSADM, data normalization, and data flow diagrams. Such information is too technical for the non-IT specialist to apply successfully; is of little or no practical use in their defined roles; or is so transient as to be of use only for an extremely short period of time before becoming out of date. The current Information Management syllabus, replacing the previous one, has made significant reductions in these procedural areas with only an overview of the systems development life cycle remaining. However, AAT and CACA syllabi include more substantial sections on traditional technical aspects of systems design. By way of contrast with the traditional approach, the CIMA Information Management syllabus now includes some human factors (syllabus section 4, in particular on Social Dimensions of Information). It will be interesting to see how far this area is extended in the current syllabus review. Other syllabi, including the revised ICA syllabus (ICA 1997), make only passing reference to IT procedures and also do not include consideration of human factors in project evaluation or in the use of information. If human factors in decision making are seen to be important then other professional bodies within the accounting domain have significant ground to make up on CIMA.

3. (NOT) RELYING ON THE IT SPECIALIST

It might be thought that, in order to avoid having to acquire human factors knowledge, the financial specialist and other non-IT personnel involved in procurement, would rely on the knowledge of accessible IT staff. The arguments against this have a number of threads. First, it should be noted that few IT specialists have a good understanding of the human factors issues relating to IT systems. Most IT courses place their emphasis on the technology; few contain significant elements on human factors. This situation is changing, but relatively slowly (Kirby et al. 1995). Some courses that do contain human factors elements do so as electives, i.e., students may choose, quite legitimately, to focus on another specialism such as network communications or database design. Thus we cannot assume that an IT specialist has the human factors knowledge required to inform the procurement decision making process. Second, many smaller organizations that are procuring IT-based systems do not have their own in-house IT staff, and so may have no ready access to professional staff that might have an understanding of human factors. Third, for the non-IT specialist to have an understanding of the issues places them in a better position to understand information being presented to them by IT specialists. When a system is sold as "highly usable" it will be possible to question the promotional statements incisively.

4. REQUIRED HUMAN FACTORS EDUCATION

It is not our purpose to suggest that financial specialists should also be human factors specialists. It *is* suggested that, within the IT sections of accounting syllabi, more weight be given to human factors issues. If that case can be made, then the next step is to identify what is required and how it might be delivered within an already well packed syllabus. To put it another way, once we know what human factors should be taught, what other IT do we throw out?

An appropriate question to ask in solving this is, "What would be the purpose of increased human factors understanding for accountants?" To answer this we need to go back to the roles of the financial specialist as purchaser and steering committee member. These roles can be summarized as supporting the acquisition of IT that best supports organizational objectives, and encompasses both effectiveness and efficiency. While efficiency is thought to be relatively easy to define and understand, at least as far as short and medium term considerations are concerned the term "effective" is more problematic.

When comparing two systems, where all other things are equal, the one with the lowest financial cost provides the greatest level of *financial* efficiency. However, it is rare that all other things are equal. We know, for example, that one system may be easier to learn and operate than another (e.g., Moyes and Jordan 1993; Pillay 1997). This cannot reliably be determined from suppliers' literature or presentations—some effort is required to determine the truth of any such claims, if claims are made. This is where some knowledge of human factors is essential. If effort is to be expended on determining the relative merits of systems options, with respect to human factors, then it needs to be known that such effort is required *and* what that effort should be. Neither of these conditions will be true if accountants are reliant on the knowledge gained from professional studies according to a typical syllabus.

When considering what a "user friendly" system is we need to go beyond the general, and often poorly applied, term "ease of use." Full consideration should be given to the patterns of use of all of the user set; e.g., managers are typically less frequent users of operational systems than are their subordinate staff. We can consider ability to learn, error tolerance, assumed expertise, and aesthetics as aspects of systems that affect their "usability." As human factors specialists, we will have been exposed to these concepts and know something of their value and application. Accountants don't have this exposure. As long as these and other aspects of the human factors of systems are given little coverage in the IT syllabus of the accountant, then purchasing decisions will be based mainly on the "bang per buck" mentality and making sure that "the users have been consulted."

5. PROPOSED CHANGES TO SYLLABI

One body, CIMA, has been considering the requirements and limitations of the "human information processor" (HIP). The use of such a theoretical construct as the HIP provides a potentially useful and versatile hook for various concepts and practices. Students under this syllabus are required to know, at a high level, what the limitations of the HIP are and what implications these might have for system design. This includes the selection of appropriate input and output devices and the provision of help sub-systems. However, the concept has not been applied, within the syllabus, to issues such as usability engineering, or detailed prototyping procedures.

The CACA syllabus (ACCA 1997) shows an *ad hoc* approach to "basics of human computer interface design." This area of design is one of six areas in the syllabus subsection System Analysis and Design, and contains these components:

(1) means of interacting with a computer;
(2) prototyping;
(3) implications of poor design;
(4) preferences for type of interface from novice and experienced users;
(5) validation and verification of data; and
(6) security measures depending on type of system.

The lack of cohesion between the human factors areas, and the absence of any theoretical underpinning such as the HIP used by CIMA, makes further continuous development difficult. While some of the topics are obviously human factors issues (prototyping), others (security) are not.

The nature of a professional syllabus is that it should be constantly under review. Our suggestion is that human factors should be part of that review process. Human factors specialists could have a view on the appropriate content of that part of the syllabus. A method for consulting that body of specialists and conveying the results to the appropriate body or bodies is required. However, in answering the question, we should also be prepared to say what we would remove from an already full syllabus. In the case of CIMA, the human factors issues identified have replaced traditional IT issues. If an even broader exposure to human factors is proposed, then it will be necessary to identify other subjects for removal.

A suitable framework for such knowledge could support the concepts of usability engineering (Whiteside, Bennett and Holtzblatt 1989; Whiteside and Wixon 1987) and usability labs (de Vries, van Gelderen and Brigham 1994; Stanton, Ashleigh and Gale 1997). Central to these concepts is the idea that usability can be specified in "hard" terms, i.e., in the form of measurable and

quantifiable system qualities relevant in the context of the organization and that these well-defined terms can be observed and tested. This will meet the accountants' need for measurable benefits. To bring this about, it will be necessary for human factors specialists to raise the profile of the field (Nielsen 1995). From such a raised position, it would be easier to reach, and be reached by, those responsible for designing professional syllabi.

6. CONCLUSIONS

Accountants, as financial specialists and resource managers, play a key role in defining the design environment. This often has the effect of limiting the scope of the human factors specialist, making it more difficult to produce effective design solutions. Accountants should be made aware of a wide range of IT issues—which should include the human factors issues relating to the acquisition of IT. This need follows from their involvement in the procurement process and the sometimes overspecialization of the IT professionals engaged in procurement. There is room in the syllabi if less beneficial material (e.g., data normalization) is removed. Such new syllabi will better prepare accountants for purchasing IT-based systems that will meet organizational needs at all levels.

The inclusion of a theoretical construct, such as the HIP of the CIMA syllabus, can underpin a wide range of human factors issues. For example, the short term memory limitations of the HIP have an effect on interface design for routine tasks, and the design of passwords in security subsystems. It would also be possible to use the HIP concept to explain and justify the need for extended user involvement and usability engineering in the procurement process. For example, prototyping and ethnography are both methods that *don't* rely on the user being able to clearly articulate their needs *and* can result in the procurement of more cost-effective solutions. Thus an understanding of the HIP can provide the accounting student with transferable knowledge that an *ad hoc* approach to human factors does not. It is to be expected that a theoretically underpinned understanding of human factors would be well suited to the novel situations found in procuring information systems. This flexibility should be a major factor when considering the human factors knowledge to impart to accountants. The next problem for us to consider is the detail of the required knowledge. While the HIP may be an appropriate starting point, does it need refinement or augmentation? As there is a considerable amount of human factors that could be included but not the space to do so, those areas most likely to be assimilated by the accounting professions might be the most appropriate upon which to focus. In this respect, "usability engineering" has much to offer in that vague terms like "usability" can often be reduced to quantitative measures. These in turn could most easily respond to cost-benefit analysis, making it easier to include human factors on the procurement agenda.

From a human factors point of view, there is still scope for expansion of content in the CIMA syllabus. While the HIP concept is a useful theoretical construct that can be related to practical examples, more explicit issues such as usability engineering might be even more directly applicable. In the broader context of all accounting qualifications, it remains to be seen if the other professional bodies will follow the path that CIMA has started out on, or if they will maintain a "market differentiation" that will reduce the significance of human factors rather than increase it within the accounting domain. The benefits to be had from the field of human factors will be limited while that knowledge is restricted to domain specialists. Including it in the syllabuses of financial professions could result in improved system designs in the years to come as the perception problems identified by Nielsen are resolved.

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