Appendix 1: Usability and Organizational Context: A Case Study of Their Interaction (and Example Report)

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This appendix gives you an example of a short report showing (a) the organization and style of such reports like you might write as a consultant or for class, (b) an example showing how multiple levels of usability may interact. This text has been slightly revised and formatted. It uses British English spelling and punctuation.

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This paper presents a case study of one organisation in which usability and organisational factors contributed together to influence the failure of a new, off-the-shelf, IT system. A further study of ten similar organisations enabled a more detailed investigation of the interactions involved. The results show how organisational factors can enable (or disable) companies from overcoming the problems caused by a poor user interface. In particular, the companies that succeeded with this particular piece of software were those with (a) dedicated, full-time users, (b) the need to use only part of the system's functionality, (c) in-house documentation / training, (d) software required for only some of organisation's activities. A methodology such as used here can only be applied to an off-the-shelf system, but it offers a powerful evaluation technique for discovering about both usability issues and the organisational impact of software.

Keywords: Usability, Organisational context, Social factors, Information Systems.

A1.1 Introduction

A recognition of the importance of social and organisational factors in determining the success of a piece of information technology is commonplace, even if the topic is still relegated to last place in many textbooks (e.g. Preece et al. (1994)) and conference programmes. Indeed some have even begun to argue that these social and organisational factors are more important than the more conventional cognitively-oriented usability factors.

Such a claim alerts one to the fact that very little evidence actually exists concerning the relationship between cognitive and organisational factors. The literature on cognitive issues focuses on attempts to predict individual usability from an interface specification or prototype, while the organisational literature addresses the ways in which a system

influences organisational structure and precipitates organisational change (for example, Clegg, Potts, Sell and Cole (1988)).

Landauer (1995) presents serious concerns over the impact of information technologies on productivity. He documents numerous reasons for the failure of IT, including many which would be regarded as organisational. However, he plays down the importance of these, preferring to emphasise the more general point that the IT systems are frequently neither useful, nor usable. But, it is clear that he would not want to go so far as to argue for the irrelevance of the organisational dimension.

Klein and Hirschheim (1983) discuss why organisational factors matter and offer techniques which may help to identify some of the organisational and interpersonal issues which might have an impact on the success of some innovation. Such methods do not, however, address the problem of designing an effective user interface.

Markus (1983) argues for an interaction model in which specific system features and the organisational context interact to influence success. Although this model can be seen as enlightened, it doesn't specify how one might progress from an understanding of the organisational factors to system specification and design.

Sauer (1993) argues that 'support' is the critical factor in IS success, whether support of users, middle or senior management. This is similar to the arguments of Hirschheim, Land and Smithson (1984) who suggest that "counter implementation" may occur (i.e. covert or overt sabotage). But in both cases, there is a failure to adequately explain how support might or might not come about, and how it relates to the problem of system specification and design.

As Clegg (1994) points out, the agenda for these two groups of researchers is really very different: "I have described some of the interdependencies that exist between organisational and cognitive issues. Their differentiation in our research is more a function of our own research traditions, organisation and practice than it is a characteristic of the problem domain." (p. 472).

Clegg's review is generally sympathetic to the organisational tradition, but even he is forced to admit that most of the research has had little impact on the design and implementation of information technology.

This paper aims to offer a small contribution to this large hole. We intend to examine the relative impact of cognitive and organisational factors in determining the success of an IT project.

Many of the details in the main case study have been changed in order to protect the identity of the company concerned at their request. In places I have had to change instrumental details, but I have always replaced them with details which I believe to have an equivalent significance. The project came to my attention towards the end of the story, when a friend was employed on the user support desk for the software concerned. Our sources for the detailed story are interviews and discussions with key players and users, the minutes of meetings of various project groups and a questionnaire of approximately 40 users.

A1.2 SF-PTT: A case study

The company concerned (we call it SF-PTT) is a subsidiary of a larger company, which made a decision in 1987 that it should restructure and sell-off SF-PTT. SF-PTT is a customer support company, whose primary activity is dispatching support staff to customers' installations. In 1993, there were around 60 local offices, organised into regional divisions, employing a total of 450 people, with a Central Office employing a further 70. These figures represent a 30-40% reduction from 1987.

In 1990 a decision was taken to introduce a new software system, prior to the sell-off, which would, in part, improve the image, and thereby the marketability of SF-PTT. This new system had to be up and running by Spring 1993, in order to be in place before the sale.

By July 1991 the operational requirements for the new system had been written. Then, in December 1991 the contract for the software (an off-the-shelf system, of necessity) was placed, and the software itself was installed and commissioned in July 1992.

A further critical role for the new software system (necessary for the sale of SF-PTT) was to help the company achieve BS5750 (a British Standard for quality, concerned with topics such as record-keeping, monitoring of performance, etc., etc.).

SF-PTT was successfully sold off in April, 1993. The software system was under close review during the summer of 1993 and there was a fair chance that it would be scrapped. Although upper management remained supportive of the system, there was widespread disillusionment at local and regional offices, with many calls for its abandonment.

Because then there have been a number of other, ownership-related changes, which mean that we do not need to tell much more of the story. At the last point at which we had contact with the company they were still struggling along, with the decision concerning the software's future being repeatedly postponed.

A1.2.1 What went wrong?

The SF-PTT story naturally divides into three phases, with problems occurring at each of these.

Project initiation

A key factor here was the urgency of the project and the centrality of BS5750. Together these led to a failure to fully articulate the system's objectives and the choice of inadequate project control mechanisms. Furthermore, although user consultation was recognised as an important process, other pressures militated against the effectiveness of this consultation. Following the user consultation, a piece of software was identified, but no formal analysis of its technical capabilities, or its appropriateness for SF-PTT was performed.

E.G. Project Control

An off-the-shelf project control methodology was chosen, which created the official impression of a well-managed project. However, many essential elements of the methodology were compromised. For example, the Project Board did not have well-defined membership or responsibilities, and all members had a direct interest in the project. Members were not provided with any training in the methodology, and there were no mechanisms in place for monitoring either the total or 'so-far' costs of the project.

E.G. User consultation

A small group of 8-10 users was established in order to compare four possible systems identified by the Project Board. Again there was no well-defined membership and no clear selection criteria.

The user group was despatched to four suppliers for a sales presentation / demonstration of the software, but with no opportunity for hands-on use. Furthermore, they were required to rank-order the four systems, with no option for rejecting all four of them.

Project implementation

Some of the problems during implementation were beyond anyone's control (e.g. change in IT manager, change in User Group Chairperson—twice), though they certainly had serious effects upon stability and information flow.

Other problems were dictated by the pressure of time. For example, the time scale of much of the implementation prevented anything more than a very short trial in just one region, and other regions were already committed to the system before that short trial was over.

Perhaps one of the key factors at this stage was the nomination of Regional Project Managers, one being required in each region. In most cases the Regional Manager took on this role, but because one goal of the system was increased centralisation, these Regional Managers were likely to lose some of their discretion and autonomy. Hence they were not especially enthusiastic about the project, which further impeded the flow of information between managers and users.

User training occurred for just one day, about 3-8 weeks before the software's initial use and before all the details of the way it would be used had been finalised. Thus, the training (and documentation) referred to the general system and to general tasks, not SF-PTT's own specific activities (35 / 40 users described the training as 'inadequate').

Live Running of the System

Problems here can be classified into system and support, hardware and the user interface.

System and support

User support was not a recognised issue until after implementation, when user demand led to the provision of a user support desk. This served to further weaken user morale and enthusiasm for the project.

The system also had some significant failings (e.g. unwieldy data format, an incomplete database of static data prior to implementation). The first of these meant that whereas users had previously known most of their customer's / equipment's 5-digit codes by heart, they now had to learn new 10-digit codes (the extra digits appear to have served no useful function). The second meant that users had to enter static data themselves as and when it was needed, in a patchy and uncoordinated manner.

The system had to handle nearly 1000 customers, 65 offices and hundreds of pieces of equipment, but the system purchased was not designed for installations of this scale. For example, searching could only be performed over a single field (e.g. "Customer name" or "Local Office", but not both). This led to numerous reports of frustration from the users surveyed.

SF-PTT purchased a 75-user licence for the software, which should have been adequate for 65 offices. However, if a terminal connection was broken by the telephone system (rather than by the correct logging-off procedure), then the user would not be counted out. Thus, it was a frequent occurrence for users to be unable to access the system because the maximum user count had been reached. This was later corrected by the software company, who implemented a kludge which enabled a central operator to reset the user count to zero. Unfortunately this had the side-effect of disconnecting all current users, without warning.

Finally, the Project Board did not consider it necessary to appoint a system administrator, which increased the lack of co-ordination and ensured that there could be no guarantees about the quality of data being entered into the system. Users developed their own procedures, strategies and short-cuts. Many of the management reports generated by the system were almost certainly based on unreliable data.

Hardware

Most of the local offices had only one PC and a printer, although some of them had as many as 10 staff who were all users of the system. Furthermore some of the local manager's tasks could take as long as 30-40 minutes to run and print.

The number of terminals could not be increased because the connections to the central office were over standard telephone lines and, therefore, increasing terminal numbers would have required the replacement of modems, or an increase in phone lines, etc., on top of the cost of extra terminals. Over 65 local offices the cost of these changes was prohibitive.

The use of standard telephone lines had other disadvantages primarily of cost and reliability. Twenty-five of the users surveyed expressed frustration at the problems of making a connection to the system.

User Interface

There were a large number of difficulties with the user interface due both to poor design and to slow system response times. For example, the interface for generating a management report required the user to understand the internal structuring of the system's data files.

The interface had a complex menu structure which users found very hard to navigate; the screen displays were thought by the majority of users to be cluttered and confusing; date entry required many, apparently superfluous keystrokes, and the on-line help system ("F1 for Help" appeared across the bottom of the screen) simply generated the message "No help available".

A1.2.2 Impact of the system on SF-PTT

Upper management

The system gave upper management greater powers to both monitor and control staff (primarily through centralised call handling), and it also enabled SF-PTT to achieve BS5750 accreditation. Management could also get rapid statistical reports on performance across the company.

In actual fact, central call handling did not survive long, because the procedures were too cumbersome, but the effect of this was to improve apparent company performance, because this could only be based on the centralised system.

The reality was that customers quickly learned to informally contact the local offices first and discuss their needs for assistance. Then, when the local office was ready and an engineer was available to go out to the customer, the local office would ring the centralised call system improving response times dramatically. In fact, given that many customers' offices were nearby the local offices, the first part of this process became a drop-by, rather than a telephone call.

Thus, although the system appeared successful to upper management, this was probably not a reliable impression.

Middle management

Through centralisation, they lost autonomy and responsibility and suffered a perceived loss of status within the company.

Staff

All other staff (whether clerical, technical or IT staff) generally suffered decreases in job discretion, job satisfaction and in feelings of job security.

For example: As part of BS5750 and the need for management statistics, the system monitored individual engineer's time. This alone would probably led to fears concerning possible future redundancies, but inadequacies in the software meant that engineers knew that the time monitoring was based on unreliable data.

The system enforced a one-to-one relationship between engineers and jobs, even though engineers might sometimes go out on more than one job, and some jobs required more

than one engineer. In the former case one job would be recorded as being done in almost zero time and one in double the expected time, whilst in the latter case, all the person-hours for the work would be allocated to just one lucky engineer. Neither of these scenarios helped to create an atmosphere of job security.

Table 1: The ten most irritating interface features (from the interviews with SF-PTT users).

The menus are difficult to navigate.	Data entry is far from simple and rapid.
Customers' equipment cannot be located and tracked.	The screens are cluttered and too complicated.
Many errors are caused by typing in lower case rather than capitals.	The rejection of modifications to key fields causes problems for my job.
The manual is not relevant to my job.	The engineer-dispatch function is hard to use.
Errors are complicated to correct and recover from.	Call entry information is tricky and slow to retrieve.

A1.2.3 Summary

Many faults can be located during the project's initiation and implementation, but many of these might have been overcome had there been adequate support for the system amongst the users and middle management. Time and the drive for centralisation were key pressures whose potential dangers should, perhaps, have been recognised.

User and management support was lacking for both organisational and usability reasons. Trying to understand the relationship between these in a single case is not easy, but given the fact that the software used was an off-the-shelf product, we decided to investigate other companies using the same system. Hopefully this would enable us to get a sense of whether this software could work in a different context, or whether it was fatally flawed.

A1.3. An investigative survey

We identified 10 further companies who were using the same software system for comparable tasks. Although we couldn't go into their full project details, we gathered questionnaire data from at least 50% of the users in each organisation and from system administrators. We also visited two of the companies to get a richer insight into their use of the system.

The questionnaire was relatively brief, asking 5 work-related biographical questions (e.g. how many hours per week do you spend on the system?), followed by a list of 10 interface-related statements for people to rate their agreement to (e.g. "Data entry is simple and rapid."). These 10 statements were derived from those interface features which were known to cause frustration at SF-PTT. Table 1 lists these 10 statements.

Our intention in this part of the research was to investigate the stability of the SF-PTT problems across different organisational contexts. In other words, were the SF-PTT problems primarily caused by the software and its interface or by SF-PTT itself.

To conduct this analysis, the average score for each interface feature was calculated for each of the 10 companies, giving a 10 by 10 matrix (see Table 2). In order to understand the effects of system and organisation we need to examine the consistency of response across companies and interface features.

The Friedman test (Leach, 1979) was used to compare the data. Comparing the judgments of each company over the ten interface features revealed a small, but significant effect ($c2 = 17.4$, $df = 9$, $p = 0.05$), suggesting that there was a common view about the good and bad aspects of the system. Comparing each interface feature across the ten different companies revealed a large, significant effect ($c2 = 27.5$, $df = 9$, $p = 0.001$), implying consistency in the way the companies viewed the software.

This analysis reveals the combined importance of system and organisational factors. But, going beyond the questionnaire data, a striking result of this survey was that while some of these 10 companies found the system quite acceptable, others (like SF-PTT) were on the verge of abandoning the system.

Table 2: The mean rating (for the ten companies) of the ten interface features in the questionnaire study. Note that the variability is greater across the companies than across the interface features.

	F'Don	D'Care	Firefly	SWL	M'Tec	BFS	TComp	BTL	DLS	ACL	Mean
Menus	2.6	3.9	2.7	4	2	3.9	2.9	3.8	3.8	2.9	3.2
Data	2.6	2.1	2.1	2.3	4	3.4	3.6	3.4	3.6	3.8	3.1
Tracking	2.2	2.3	3	3.3	4	3.4	3.1	3.6	3.9	3.2	3.2
Layout	2.2	3	4	2.7	1.9	2.8	3.5	3.4	3.4	3.6	3
Manual	1.4	2	3.4	2.4	1.5	2	3	1.6	3.1	3	2.3
Fields	1.2	1.9	2.3	1.5	4	2.5	3.2	2.8	3	4.2	2.7
Case	1.8	3.2	1.2	4	3.5	3.8	4.4	3.2	2.7	3.8	3.2
Dispatch	1.8	2.8	4	3.3	3	3.2	2.4	3.8	4.2	3.9	3.2
Error	1.4	2.7	2.7	2.7	3.5	3	3.3	4	2.8	2.6	2.9
Retrieval	3.2	2.7	3.3	3.3	3.1	3	3.5	3.8	3.6	3.4	3.3
Mean	2	2.7	2.9	2.9	3	3.1	3.3	3.3	3.4	3.4	

One company manager commented that "This system has not been a total waste at least we know what not to buy next time." Whilst another, more positively suggested that "As an off-the-shelf package it will never meet all of our operational requirements. This would probably be the case with all offerings from other suppliers." Decisions to stick with the system or to abandon it were not being based just on user reaction, of course. One company which determined to stick to it actually had the second lowest score in the questionnaire.

Closer inspection of the data reveals that a few companies show an unusual pattern of responses for the interface features. In one case it came to light that an interface feature had been rated as acceptable, when in fact the feature was almost never used. Investigation of these companies revealed four organisational moderators of usability ratings.

A1.3.1 Organisational moderators of usability

Four features occurred in the four companies which had successful implementations and which tended not to occur in the other six. importantly these four features were not present in SF-PTT either.

These features were:

- *A dedicated group of users* : In some companies the users were new employees, whose only tasks were using the system, whereas in others the users were also the engineers, customer support staff, etc. The latter group of discretionary users showed far lower levels of support for the software than did the former group whose jobs existed because of the system. Also, this difference led to the development of local experts, etc. who had overcome many of the interface problems.

- *User support* : The successful companies had all developed in-house documentation describing the use of the system for their own specific tasks, rather than relying on the generic documentation provided from the software company. Training was much more intensive in these companies and they tended to have active user groups and internal support desks.

- *Limited use* : The software concerned was capable of running / monitoring many aspects of a company's processes, but in the successful case, the companies had decided to limit themselves to only a small fraction of its capabilities. In three of the four companies, only one-third of the system's modules were being used. Furthermore, the dedicated users were often specialised to only one or two modules.

- *Limited role* : Furthermore, the four most satisfied companies were not dependent upon the system in the way that, for example, SF-PTT, was. In fact, these companies saw this package as support for one just one aspect of their company's performance.

A1.3.2 Summary

Taken together these case studies reveal how management, organisational and user interface issues interact to determine the success of an IT project. A simple perspective might lead one to conclude that organisational factors are paramount, but the comparison with other companies reveals that organisational factors play a significant role in determining the impact of user interface issues.

In particular, user interface issues interact with organisational properties to affect the level of support which the systems acquires from users. Sauer (1993) argues strongly for a support based model of the success / failure of information systems and the results described can certainly be accommodated within such a framework.

A1.4. Implications

Firstly, HCI should avoid arguing about the relative importance of usability and organisational / social factors and recognise their power to interact with each other. The data presented in this paper strongly support the interactive model presented by Markus (1983) and indicate some of the key factors that will influence the nature of that interaction.

Secondly our results show how complex these interactions can be, with organisational factors moderating the impact of poor usability. Although we didn't observe it, it seems probable that the reverse could also occur, with interface usability moderating the effect of organisational variables.

Thirdly, the main study here reveals that many writings in HCI are wildly optimistic about the realities of system design and procurement. All of the critical aspects of our study have been documented before. Yet, the case presented here, and other recent cases in the UK (e.g. the London Ambulance Service, the Wessex Regional Health Authority) suggest that these lessons are still not being learnt.

Finally, we believe that a methodology which relies solely upon individual case studies, or upon multiple, different cases does not have the power to reveal these complex interactions. We would like to recommend that there should be more research conducted which uses the methodology employed here one detailed case study, followed up by a broader, shallower survey. A constraint on such an approach is that it requires us to study off-the-shelf software, whereas most case studies in the literature seem to be of dedicated systems. However, off-the-shelf software is probably produced and sold in greater numbers and may, therefore, be more deserving of our attention.

A1.5. References

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