Business users and the information system development process: a need to know basis

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Abstract

We discuss the growth, the benefits and risks, of business users taking a more active part in developing computerised information applications. After briefly discussing IS (information system) development management issues relating to user based IS development, we propose a framework for indicating the extent to which particular business users need to know about the process of developing IT systems. We then outline our recent research which addresses the measurement of BUD (Business User Development) success factors and identifies typical IT involvement levels of business users.

We can conclude that BUD outcome effectiveness can be predicted using measures of contributing factors, a framework can be used to indicate the level of IT development process knowledge needed by business users, and that improved tool support would enable business users to be much more actively and directly involved in IS development. Given the current tool support environment, many agree that business users and managers need to be educated to acquire 'good' systems design and implementation techniques. An important assertion in this paper is that appropriately

designed tool support would significantly reduce the need for IT training of business users.

Keywords

Business users, end users, application development, effectiveness, modelling

1 INTRODUCTION

We are currently faced with a business community who are largely not satisfied with the suitability of implemented software systems, and whose businesses are not benefiting sufficiently from the potential of IT (Warden, 1989; Rauterburg, 1992). This is often referred to as the 'software crisis' (Swatman, 1992).

The introduction of networked personal workstations in recent years, together with the proliferation of PC-based software, has precipitated the trend of transferring powers of choice and operation of software away from centralised IT departments to the business personnel intending to utilise or benefit from the implementations (Amoroso, 1992; Davies, 1990; Huff, 1992).

The aim of our research is to gain a better understanding of how the potential of business users (to develop systems) can be measured, and improved.

2 ANALYST-USER COMMUNICATION

A survey study (Stobart, 1991) has identified that poor user-analyst communication is a key software development problem area, and this is supported by others (Joshi, 1992). It is widely recognised that the more successful analyst/designers are those that, in addition to substantial IT skills, have knowledge of the application area and so can map between the expected business behaviour and the structure of the software needed to support this behaviour (Warden, 1989; Curtis, 1992).

Research suggests that the issues associated with the roles and interaction of analysts and users are complex and that there are inherent conflicts (Shah, 1994; Ward, 1994). Research (Miller, 1993) has shown that the effectiveness of the requirements analysis process can be enhanced by focusing on the user's view of their needs rather than the systems analyst's interpretation of them.

One approach to addressing the problematic issue of analyst-user communication is to consider user-led project work. The premise is that user-led development reduces the need for the communication of requirements and IS models between different role players.

3 END USER COMPUTING

End User Computing (EUC) can be defined as the direct use of computing resources by office, professional or managerial personnel (Bergeron, 1993). We also utilise the term *Business User Development* (BUD), which refers to the activity of *building* computerised information systems of varying size, by people who primarily have a business role associated with the information system concerned.

The 'meta-analysis' of previous studies shows that the relationship between *user involvement* and *system success* is positive and significant (Pettingell, 1988). This is supported in findings from an Australian field study (Nicholis, 1990), and other work concludes that the effectiveness of technology increases when more directly in the hands of business developers (Boone, 1991; Dodd, 1994; Khan, 1992).

It has been suggested (Amoroso, 1992) that BUD eliminates the problems associated with ineffective communications between analysts and end users, and produces the added advantage of ownership transfer to the end users.

4 ASSOCIATED RISKS OF USER DEVELOPMENT

There is a widely expressed concern about the potential risks associated with BUD, resulting from the elimination of the IT specialist role (Cale, 1994). A study (Sumner, 1987) shows that end users directly involved in development projects tend not to utilise some of the practices traditionally followed (eg. data validation, documentation and security). The use of *Information Centres* may be a useful way of providing technical support to users in these areas (Guimaraes, 1994). It has been suggested (Salchenberger, 1993) that BUD tends to suffer from the lack of sufficient requirements analysis, and proposed that a comprehensive set of guidelines might help end users apply a structured approach. We sympathise with these findings, but suggest that more powerful tool support could considerably reduce these problems.

5 USER BASED IS DEVELOPMENT - MANAGEMENT RESPONSIBILITIES

There is a growing responsibility of management, in many cases with no computing-related qualifications, to exercise control over substantial IT resources (Harris, 1992). We support the notion that the monitoring and control of BUD activities should be managed by business managers carrying out the role of IS management (Khan, 1992). Modern organisations utilise a variety of approaches, within a range of environments, to develop and manage the development of their information systems. Hence the extent to which business personnel require to know about the process of developing IT solutions for a business information system need will vary. Table 1a and Table 1b illustrate a suggested framework for indicating such requirements.

Table 1a: Process Knowledge Framework (part (a))

<i>IT development process knowledge (business users) influences</i>		
<i>REQ'T LEVELS</i>	<i>TASK COMPLEXITY</i>	<i>DEVELOPMENT STYLE</i>
<i>Higher</i>	Multi Dept/Complex systems Database Design + Processing Multiple file/screens Simple Database Queries Spreadsheets (build) Spreadsheets (use) Decision Support applications (use) Data entry applications (use) View information	User Based Development User Led Projects User/IT Expert prototyping IT expert/User prototyping IT Specialist led project
<i>Lower</i>		

Table 1b: Process Knowledge Framework (part (b))

	<i>Technical Support</i>	<i>Tool Support</i>
	<i>(assuming user-based development style and a given task complexity)</i>	
<i>Higher</i>	Centralised IT dept. (no user support) IT dept user support Info Centre support Decentralised Specialists User Based Support Groups User Support Infrastructure	Traditional environment Window based environment 4 GL/application builders Decision Support Tools User Targeted Builder Tools
<i>Lower</i>		

It follows that as the required levels of 'IT development process knowledge' rise then the training/education needs of business users will increasingly need to be considered to make up for any shortfall in skills and experience. We contend that it could be too much to expect that typical business users should be highly skilled in systems development techniques *and* also build up and maintain extensive business related knowledge. Apart from the practical problem of providing effective education, there is the potential problem that attention will be diverted from their primary role (in terms of practicing and maintaining business expertise). The framework (Tables 1a and 1b) indicates that for a given task complexity, and assuming that the project is 'user based', the required level of IT development process knowledge can be reduced by providing improved support for business users.

Our research involves the consideration of advanced tool support for BUD participants. The objective is to develop tool support which assists with IT design

decisions (Shah, 1996) - building the relevant IT 'expertise' into the tool itself, which is an idea supported elsewhere (Benham, 1993).

As a precursor to tool prototyping we have completed a survey to gain a better understanding of the factors which influence the effectiveness of BUD outcomes, to form a view of the levels of EUC and BUD activities currently practised in typical business organisations, and to assess the potential for business user empowerment.

6 USER SURVEY

The survey used a questionnaire instrument previously piloted (Lawrence, 1995). The results and conclusions are based on 69 responses received from a total of 24 UK organisations, out of 80 organisations approached, covering sectors such as financial services, building, public services, retailing, and engineering. In all cases, the contacts were asked to arrange for questionnaires to be completed by personnel who *primarily* had a *business* role within the organisation, and also had some interaction with IT. The participants ranged from office clerks, through experienced professionals, to a divisional manager.

We used the questionnaire survey to gain ordinal measures of BUD contributing factors for particular individuals, and also of BUD outcome effectiveness. There have been many attempts to model and measure the criteria for success of an end user developed application (Rivard, 1994), but no universal set of factors has been established. We chose factors on the strength of practical personal experience in the IS development area. The selected factors (IT experience, business/IS knowledge, role power/freedom, and tool suitability) are also in harmony with conclusions made in reviews of previous research in this area (Brancheau, 1993). In our studies (we follow (Bergeron, 1993) and (Brancheau, 1993)) we view BUD effectiveness in terms of the levels of 'user access to information', 'actual usage', 'user satisfaction', 'business benefit', and 'implementation frequency'.

Total scores are calculated for each contributing factor and compared to scores for perceived BUD effectiveness. There are also text based questions, which are designed mainly for cross-reference purposes, and a section which deals with ascertaining the level of involvement in specific EUC and BUD activities.

7 BUD EFFECTIVENESS PREDICTION

This area of our survey analysis is discussed in detail elsewhere (Lawrence, 1996), and concludes that each of the contributing factors directly and indirectly influence BUD effectiveness. The role (power and authority) and tools (suitability) factors are shown to be dominant. We can use statistical, as well as less formal, methods to predict outcome effectiveness based on measures of contributing factors - which is very useful in resource/strategic planning.

8 PROFILE OF EUC ACTIVITIES

Our questionnaire includes a section which inquires about the involvement of the participant in a fixed set of 28 recognised EUC activities (we have enhanced and extended a list of activities/attributes previously utilised (McLean, 1992)). Tables 2a-2d provide summaries of the results obtained. Each participant in the survey was asked to rate each aspect from 0 to 5 (5 being high). Tables 2a, 2b, 2c and 2d show the 'top 10' placings of activities in terms of numbers of business users involved, average individual involvement, average outcome satisfaction level, and average tool satisfaction level respectively.

It can be seen that the predominant business user activities *still* (i.e. even after increases in widespread exposure to IT and end user tools over recent years) seem to relate to wordprocessing and spreadsheet work and the *use* of databases and database queries. A noticeable feature is that there is a high level of use of e-mail systems. We can also see that there is some evidence of business users being involved in system *building* activities (albeit in relatively small numbers).

Activities which have high 'avge involvement' also tend to have associated relatively high average values for 'outcome satisfaction' and 'software/tool rating' (see Tables 2b, 2c and 2d). It is unclear whether *increased involvement* produces higher levels of satisfaction/tool ratings, or perhaps whether it is the suitability of tools which encourage more involvement, which in turn leads to greater outcome satisfaction. A further point is that building activities tend to be associated with lower tool support ratings.

Table 2a:**Highest number of users**

Spreadsheets (use)	44
Wordprocessing	43
Database queries(use)	35
Spreadsheets (build)	34
Electronic mail (use)	34
Small databases (use)	23
Company d'bases (use)	23
D'base queries(build)	22
Desktop publishing	20
Syst analysis/design	18

Table 2b:**Highest avge involvement**

Electronic mail (use)	4.1
Wordprocessing	3.8
Database queries(use)	3.7
Spreadsheets (use)	3.5
Company d'bases (use)	3.5
D'base queries(build)	3.5
Spreadsheets (build)	3.4
Small databases (use)	3.3
Small databases(build)	3.3
Transaction systems(use)	3.1
Desktop publishing	3.1

Table 2c:**Highest avge outcome satisfaction**

Spreadsheets (use)	3.3
Company d'bases (use)	3.3
Electronic mail (use)	3.1
Manufacturing sys(use)	3.1
Wordprocessing	3.0
Database queries(use)	2.9
Company databases(build)	2.9
Spreadsheets (build)	2.8
Small databases (use)	2.8
D'base queries(build)	2.8
Prototyping(as developer)	2.8

Table 2d:**Highest avge software/tool rating**

Spreadsheets (use)	3.2
Company d'bases (use)	2.9
Electronic mail (use)	2.9
Wordprocessing	2.8
Spreadsheets (build)	2.8
Database queries(use)	2.6
Prototyping (as user)	2.5
Desktop Publishing	2.3
D'base queries(build)	2.2
Small databases (use)	2.1
Computer Aided Training	2.1

9 SUCCESS FACTOR LEVELS

Table 3 shows that most of the participants in the survey have levels of IT expertise of either 'medium' or 'high' - which is to be expected as computerisation is no longer a new phenomenon in business. However, we would have expected the proportion to be higher. The number of participants (20 out of 69) who seem to have low levels of Business/IS knowledge could be of concern to business managers - who possibly might have expected greater levels of understanding.

Table 3: Success factor levels

<i>FACTOR</i>	<i>No. of participants at level</i>		
	<i>LOW</i>	<i>MEDIUM</i>	<i>HIGH</i>
IT expertise	5	27	17
Business/IS Knowledge	20	13	36
Role power/freedom	40	15	14
Tool Suitability	47	13	9

Table 3 shows that many users have tools which have limited scope and power, and also indicates that a significant proportion of users might also be constrained in BUD activities by the nature of their role/authority. These conclusions are supported by some of the text based responses received.

10 CONCLUSIONS

- i) We have illustrated the importance of EUC and BUD, and discussed issues related to the management of user involvement in IS development projects. We also propose a framework that helps indicate the extent to which business users need to know about the process of developing an IT solution for a business information system.
- ii) We contend that attention should be given to improving tool support for business users actively involved in user-based development projects.
- iii) We can predict BUD outcome effectiveness using surveyed measures of the identified contributing factors.
- iv). We have shown that the questionnaire enables a detailed profile of the participant and their EUC activities to be constructed. The results suggest that business users in the UK, tend to be involved in EUC activities at the level of wordprocessing, spreadsheeting, database access, and e-mailing. It is a minority which is actively involved at the level of application or system *building*.
- v). Our results show that business users may need improved tool support and role power/freedom to enable them to be more effective in BUD activities. Our future research will include the prototyping of advanced BUD tool support.

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12 BIOGRAPHIES

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