Microsoft Excel: 21st century abacus or end-user development tool?

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Abstract

End-user development of Information systems is of interest to end-users, business organizations, academics, students, educators and trainers. Microsoft Excel is being widely used in organizations by business professionals. This paper presents a research proposal for a Masters thesis. The aim of the study is to find out more details of what Microsoft Excel is being used for and how it is being used in an organizational context. The two ends of the spectrum, for use of Microsoft Excel, may be seen as simple calculations (21st century abacus) and end-user development of sophisticated decision-making systems end-user development tool). End-user computing has been of interest and has been widely researched for at least the last twenty years. There is evidence in the literature that it continues to be a topic of interest. The literature also convinces one that research which is relevant and practical is of importance to the business community especially. The proposed study will take an interpretivist approach rather than a strictly positivist approach. A survey of a number of business organizations, both large and small, will be used to gather initial data, which will be quantitatively analysed. The data will also be used to identify candidates for face-to-face interviews as a means of case study in a number of organizations, both large and small. This will allow for qualitative data and analysis.

Keywords

Microsoft Excel, spreadsheets, end-user computing, end-user development, information systems

1. Introduction

This paper is a summary of a research proposal written as part of the course of study for a Masters degree in Computer and Information Sciences. It is intended that the proposal described here will be used for the Masters thesis of the author. The use of software tools, such as Microsoft Excel (hereafter referred to as Excel), by end-users is widespread and has a definite impact on decision-making within Business organisations (Burnett et al, 2003; Randolph, Morris, & Lee, 2002; Babbitt, Galetta, & Lopes, 1998). The use of Excel, a spreadsheet tool, can be seen as one example of end-user computing, or end-user development (Rothermel et al., 2001). Excel is widely used as an end-user development tool. Excel is considered, by some, to be a programming language.

End-user programming has become a widespread phenomenon. For example, end users create and modify spreadsheets, they author web pages with links and complex formatting specifications, and they create macros and scripts. Although some of these programs are small, one-shot calculations, many are much more serious, affecting significant financial decisions and business transactions (Burnett et al 2003, p 93).

The focus on Excel is appropriate as the range of software available to end-users is far too extensive to be considered in any depth in a single study. In this proposal the terms end-user development (EUD) and end-user computing (EUC) are used interchangeably. The term "end-users" covers a wide range of professionals both in business and in educational contexts. End-
user can be defined as: anyone who is not an IS (Information Systems) or IT (Information Technology) specialist. "An end-user programmer is a teacher, an engineer, a physicist, a secretary, an accountant, a manager, in fact almost anything except a trained programmer. These people use computers to get their job done." (Peyton Jones et al 2003, p 165). This research is specifically focused on business professionals as end-users. The term "business professionals" encompasses the normal range of functionality which exists in most business environments - accounting, marketing, sales, management, distribution, manufacturing, and so on. There is much evidence, in the literature as well as in practise, to indicate that business professionals form a significant body of end-users (Rockart and Flannery, 1983). The principal aim of this research is to discover more about the actual use of Excel by business professionals. There is no doubt that end-user computing has had a profound effect on the way that business professionals carry out their work (Harris, 1992). Using Excel as the example, we will be able to determine what sort of impact end-user computing has on the work of business professionals. Who uses Excel, what is it used for, what Excel functions and tools are used or not used, how often is it used, what training have the users had, if Excel is not used, what other spreadsheet software is used, if any? Does the use of Excel compliment and interface with corporate systems or does it replace corporate systems or are there no corporate systems for the application(s) excel is being used for? Does the use of Excel differ according to the size of the organization and the level of support or facility provided by the IT group? Is Excel used primarily for decision support systems (DSS) or for management information systems (MIS) or transaction processing systems (TPS)? The primary outcome of this research is to have better information about the use of Microsoft Excel by business professionals. This knowledge will add to, and continue the work of, the already substantial research into end-user computing. This will then be useful for organisations, for academics, and may also inform teaching and training.

2. Literature Review

End-user computing, as an area of interest, was discussed even before the advent of the ubiquitous P.C. (Personal computer). However, the early 1980s and the availability of the P.C. and the introduction of user-oriented software had a huge impact on this field.

The last decade has seen a rapid expansion in the amount of information technology implemented in business. One example of such technology transfer has been in the area of end user computing (EUC) which, in most organizations has quickly become a de facto part of many office worker's jobs. The pervasiveness of EUC can be attributed to many forces, the decline in the cost of microcomputing hardware, the increasing computing literacy of users, and the expansion in the availability of easy to use software products. (Barker & Wright 1997, p 224)

At this time there is at least 20 years of literature to consider. Powell & Moore (2002) surveyed ten years of literature on end-user computing from 1990 to 2000. Their work built on the previous work of Brancheau & Brown (1993) and used the Brancheau & Brown model to classify literature. Brancheau & Brown reviewed the literature of the 1980s up to 1990. Downey in 2004, also reviewed the literature on end-user computing through the 1980s and 1990s. His main focus was "all EUC articles from five leading IS journals for the years 1990-2000" (Downey 2004, p 2). Downey discusses the importance of end-user computing, the major issues, and classifies the literature in terms of end user dimension, technology dimension, and organizational dimension. Downey's conclusions include a number of developing trends. One of these is a growing trend in research articles focusing on the end-user. Downey's study also concludes that EUC research is prevalent, important and viable. When we consider the realm of end-user computing we should not underestimate the scope and size of this activity. "The number of end-user programmers in the United States is expected to reach 55 million by 2005, as compared to only 2.75 million professional programmers" (Myers & Burnett 2004, p 1592).

In the 1980s, end-user computing was sometimes seen as the answer to MIS management problems that had begun to exist in organisations. Problems such as lead-times for traditional systems development and the lack of accessible information for users. This answer to "user prayers" was particularly relevant to the use of the spreadsheet. Users were finally able to provide information systems for themselves, without the previous reliance on Information Systems specialists. "Then came a revolution, in the form of the personal computer and the spreadsheet... Managers no longer needed to humbly petition the mighty Lords of IT to
develop even simple analytical tools" (Grossman 2003, p 12).

It is interesting to note that even in 2004 people were still writing about the end-user revolution that started in the early 1980s. Some of the literature also leads us to believe that this revolution has been very successful. McGill (2004) studied end-users developing Excel spreadsheets to measure the effect of their participation on their satisfaction with the end product. McGill concluded that significant advantages exist for the end user developer.

End-user computing has been studied widely in the literature but Excel itself does not seem to have been studied to any significant extent (Burnett et al, 2003; Nardi & Miller, 1990; Bell & Parr, 1993).

2.1 Spreadsheets

Spreadsheets, in electronic form have been in existence since before the introduction of the P.C. The forerunners to packages such as Excel, and Lotus 1-2-3, were packages such as VisiCalc which ran on mainframe or mini computers. Even in 1987 spreadsheet programs were reported to be impacting the business world. "According to the trade press, electronic spreadsheets have had a substantial impact on the business world. In 1979, the first electronic spreadsheet package, VisiCalc, was developed, modelled on the accountant's financial ledger. Since that time spreadsheet programs have attained pervasive usage" (Brown & Gould 1987, p 258). "Despite the prevalence of spreadsheets in the personal computing world, spreadsheets have not been widely studied" (Nardi & Miller, 1990, p 198).

There is however, some research into the use of spreadsheets. A study by McLean et al backs up the viewpoint that spreadsheeting may be used more widely and significantly that any other end-user application. (McLean et al, 1993, page 85, table 19).

2.2 Excel and DSS (Decision Support Systems)

Many authors tell us that Microsoft Excel, or spreadsheets generally, are used by many business professionals in the workplace to perform business tasks, including decision support. This research will purposefully not be limited to the use of "decision support systems" although I expect that much use is being made of Excel for decision support. As Holsapple, as cited in Hall, states there may not be clear agreement amongst users about what decision support systems are. "Holsapple takes a different view. "Decision-support systems are so pervasive in their use that people don't even think of them as DSS," he says. He points to the spreadsheet as one of the most common ones used in business today" (Hall, 2004). Excel may be used commonly for decision support but it is not purely a "decision support system" tool. The intention of this research is to gather more information about the use of Excel in the workplace.

2.3 Use of Excel in the Workplace

There is some evidence that Microsoft Excel is used more widely than any other similar spreadsheeting package. "Microsoft Excel clearly dominates the spreadsheet market...;with an estimated 90% of market share"(Walkenbach 2004, p 1). Many people use Excel every day for problem solving (Gips 2003).

Despite anecdotal evidence that Excel is widely used, there seems to be little research into the actual use of Excel in the workplace. "There has been a mass of exhortative literature and occasional single case-based discussion of end-user computing. But there has been a paucity of conscientious research into who the users are, what they are doing, what they need are, and most significantly, how to manage this new phenomenon" (Rockart & Flannery 1983, p 776). Barker also referred to the impact of EUC on the work of the users. "Insufficient emphasis has been placed on the role of EUC on the jobs users actually perform" (Barker 1993, p 100).

Is Excel being used as a calculator (21st century Abacus), as a decision support tool, as a receiver of corporate data, as a database, or as a end-user development (EUD) tool? What are the primary uses of Excel and which Excel functions are most widely used?

What are Business professionals using Excel for? how are they using it? have they had
training in Excel? This research will inform anyone interested in the use of spreadsheets, or in end-user computing. It has implications for software vendors, for training institutes, for the education sector and for organisations. Yet, we still do not understand how spreadsheets are being used. (Nardi & Miller, 1990).

Powell and Moore discussed directions for future research. "Many factors are emerging in today's business environment that are likely to contribute to an increase in the complexity and the types of tasks for which end users seek to employ EUC. These newer segments of the user environment need to be included in future investigations and to do so, studies will need to address task and end user action (as well as the end user and tool components)" (Powell & Moore 2002, p 16). There are many tertiary programmes and private training courses which teach the use of Excel. These are generally based around previous knowledge and assumptions about which aspects of Excel are important for business professionals and about what business professionals may be using Excel for. This research will focus on business professionals to see what is happening in this area. Consequently, this research may inform educators and trainers, and perhaps lead to modification of courses and training programmes so that they more closely match the business professional's actual needs.

3. Methodology And Methods

In considering how to go about research it is important to consider the options in terms of the choice of methodology. It is also important to consider the place of the research within a discipline field. The research described in this proposal belongs to the field of Information Systems (Downey, 2004). There are many views and definitions of what "Information Systems" means as a discipline. And in fact there has also been debate about whether Information Systems is a discipline in its own right. Cornford and Smithson use a number of differing views in their exploration to define what information systems is about (1996). Their favoured view is that "information systems are social systems". Implied in their definition are a whole range of other factors apart from the social factors. Information systems involve the use of technology; hardware and software, to achieve goals. People use technology to transform data into information. People in the workplace use information to help them to make decisions. Thus, any research into information systems needs to consider the technology, the people, the processes, and the outcomes. In considering that "information systems are social systems" this research will focus on the end-users, the choices they make, the technology they use and the outcomes they produce. We cannot separate the use of Excel from the user or the social context of the organization. It is considered that the use of a survey and several case studies, via in-depth face-to-face interviews, will provide the depth of information sought in this research.

3.1 Case Studies

Lee (1989), in his widely accepted paper in MIS Quarterly, writes "there is a strong case-study tradition in the academic field of management information systems", and "at the same time, case researchers in general are still attempting to clarify the methodological basis upon which to conduct case studies"(p 33). Lee goes on to describe the methodology of single case studies and to discuss the problems and issues associated with scientific method and scientific rigour. Lee refers frequently to the Markus case study of 1983, and says "the MIS case study by Markus may be regarded as an exemplar for scientific MIS case studies in general, where the meaning of "scientific" is the one embodied in the natural science method" (Lee 1989, p 36).

Avison (1996) reports that there is increasing recognition of social and organisational issues in information systems research and says that surveys, case studies and action research are commonly used. However, there is also evidence of a wide range of other approaches.

3.2 The Interpretivist vs the Positivist Approach

Klein & Myers (1999) discuss interpretive field studies and the classification of IS research as interpretive if it considers social constructs. Klein & Myers propose a set of principles for interpretive field research. "Interpretive research can help IS researchers to understand human thought and action in social and organizational contexts" (Klein & Myers 1999, p 67). In so far as interpretive research involves human beings, thought, decisions and actions, there is certainly an interpretive focus on the research being proposed in this proposal. Benbasat & Zmud (1999) discuss relevancy of IS research and the importance of IS research being of
interest to IS practitioners. They conclude that North American IS journals are now more welcoming of qualitative and case-oriented studies than they were in the past. Lee (1999) and Lyytinen (1999) both subsequently wrote papers which commented on the ideas of Benbasat and Zmud. All three of the above papers were published in MIS Quarterly in 1999 and if you take the three together as a total picture, what is most relevant is the debate and the diversity of thought. However, one interpretation is that IS research does not need to be positivist in order to be of importance and relevance to the IS community. There are other examples of the debate about the use of positivist vs interpretivist approaches and evidence of the use of a combination of these two approaches (Fitzgerald & Howcroft, 1998). Mingers (2001) reported a growing use of nonpositivist approaches and particularly, the use of interpretivism. Mingers discusses multimethod, or pluralist, approaches where methods from the different paradigms are used to provide greater richness of information. Mingers advocates that one needs to pay attention to social and political context. Mingers advises: "do a statistically analysed questionnaire then follow up with some in-depth interviews to better understand the results" (Mingers 2001, table 1, p 252). Goles and Hirschheim (2000), using Burrell & Morgan's framework of paradigms as a base, also look at the possibility of paradigm pluralism. Goles and Hirschheim (2000) tell us that although traditional IS research was done from a positivist perspective, there has been an increase in the use of pluralist approaches. One of the most recent pieces of literature to discuss paradigms and methodologies for information systems research is by Chen & Hirschheim (2004). Their study reviews 1893 articles published in eight major IS publication outlets between 1991 and 2001. The findings of this study are that surveys are still the most widely used method and that positivist research continues to dominate. However, Chen & Hirschheim are clearly advocating a more pluralist approach.

3.3 The Proposal

The following outline of the methodology for the proposed study is well supported by the literature, both current and traditional, in the Information Systems discipline. The research will be conducted by survey and then case studies using face-to-face interviews. The survey will be via questionnaire, of which there will be a pilot. The use of interviews as well as questionnaire allows for a less positivist and more pluralist study, which will also provide more relevant and richer research (Mingers, 2001). A sample population of Business professionals in New Zealand organizations will be surveyed by questionnaire. Approximately 50 organizations will be selected. Both large and small organizations will be included so as to possibly also evaluate any differences in the use of Excel relating to size of organisation. Business professionals will be chosen from all disciplines or functions within the organisations - accounting, sales, marketing, manufacturing, distribution etc. The focus is on "end-users" rather than on Information Systems professionals, IS professionals will not be included. The survey data will be quantitatively analysed and data will also be evaluated to determine candidates for a more interpretivist case study. A small number of organizations (approximately 3), and approximately 50 individuals from within these organizations, will be selected for interviewing. One of the survey (questionnaire) questions will be willingness to be interviewed and consequently participate in a case study. The organizations for case studies will be chosen based on the extent to which Excel is used in the organisations and the variety of Excel functionality used. Size of organization will also be considered so as to represent both large and small ends of the scale in the case studies. In choosing to do a number of case studies for this research, there should be a depth of data not normally found in a single case study. Daniel Moody discussed the relevance and impact of IS research, the debate over methodologies, and the importance of IS as an applied discipline. "IS will not achieve legitimacy by the rigor of its methods or by its theoretical base, but by being practically useful" (Moody, 2000). This research proposal pays attention to rigor and methodology and asks a question (How is Excel being used in the workplace by business professionals ?), which has practical use and interest for academics, IS practitioners, teachers and trainers, students, and the business community.

4. Conclusion

Within the field of Information Systems, the use of Excel as an end-user computing tool is widespread. The literature reviewed supports the interest in this field and the need for further research. There is a place for detailed investigation in to the actual use of MS Excel as described above. It is the intention that this research proposal will develop into a Masters thesis which will add to the body of literature.
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