Exploring the links between technology acceptance and use and the attainment of individual and organisational goals: a case study in the community health sector

Louise Schaper

School of Information Systems, Curtin University of Technology, Perth, Australia n

l.schaper@curtin.edu.au

Graham Pervan

School of Information Systems, Curtin University of Technology, Perth, Australia

Graham.Pervan@cbs.curtin.edu.au

ABSTRACT

This paper examines technology acceptance and use and the associated individual and organisational impacts within a small non-profit, community-based health care organisation. The study described involved a longitudinal multi-method investigation, collecting quantitative and qualitative data over a 7-month period, timed in conjunction with the implementation of a new information system infrastructure. A research model is proposed and explored. The substantial data collected enables comprehensive analysis of the links between technology acceptance and use with the outcomes and impacts of use on individual and organisational goals. Results from this study provide qualitative support for the proposed model, demonstrate the invaluable role of individual commitment to the organisation and to the matching of organisational and individual goals. This work highlights the complexity of the constructs and relationships that influence technology acceptance and outcomes and highlights a need for reconceptualising current models. Results also highlight demonstrate the importance of qualitative methodologies in information systems research. The significance of this work and the implications of the findings are discussed.

Keywords

Technology acceptance, technology use, UTAUT, allied health, organisational and individual goals and outcomes, qualitative methodology

INTRODUCTION

The need to link research on technology acceptance and use to the outcomes and impacts of use or non-use is a theme gaining increasing prominence in the information systems literature. This is a complex and challenging task due to the varied, sometimes questionable, or often absent, methods employed by organisations to measure technology investment outcomes and to link them to the goals of the organisation and the individuals in their employ. Nowhere is this more so than in the health sector; an inherently complex domain that has traditionally lagged in its adoption and utilisation of information and communications technology (ICT) (Chismar et al. 2003; Dearne 2003; Murray 2002; Wenn et al. 2002; Western et al. 2001).

THE RESEARCH MODEL

Various theoretical models have been devised to investigate technology acceptance. The research model employed in this study (Figure 1) is being concurrently tested in a much larger study of health professionals across a major part of Australia's allied health sector (Schaper et al. 2004a; Schaper et al. 2004b). It draws on findings from relevant prior research and is primarily based on the UTAUT model (Venkatesh et al. 2003) and on the generic framework for technology acceptance proposed by Chau & Hu (2002). For a full discussion of the development of the research model see Schaper et al. (2004a) and Schaper et al. (2004b). The UTAUT model was adapted for this research due to the comprehensiveness and rigour applied in its development and its high explanatory power, while Chau & Hu's (2002) framework was adapted for this research due to its applicability to acceptance within the health sector and for its provision of contexts which assist a systematic examination of technology acceptance that can be targeted for recommendations to various stakeholder groups.

The research model theorises that technology acceptance has three dimensions: 1) characteristics of the individual; 2) characteristics of the technology; and, 3) characteristics of the implementation context. Variables such as age, gender, clinical speciality and workload moderate the key relationships in the model. The characteristics of individual users are grouped within the individual context. The technological context refers to the characteristics of the technology itself and is made up of two determinants – performance expectancy and effort expectancy. The implementation context refers to the

specific professional environment of the user and includes the determinants of social influence, organisational facilitating conditions and compatibility. It is the implementation context which is theorised to have the predominant influence on user acceptance, as it is within this dimension that organisational and social issues are examined and, importantly, the compatibility of the technology with the clinical priorities of delivering positive outcomes for clients.
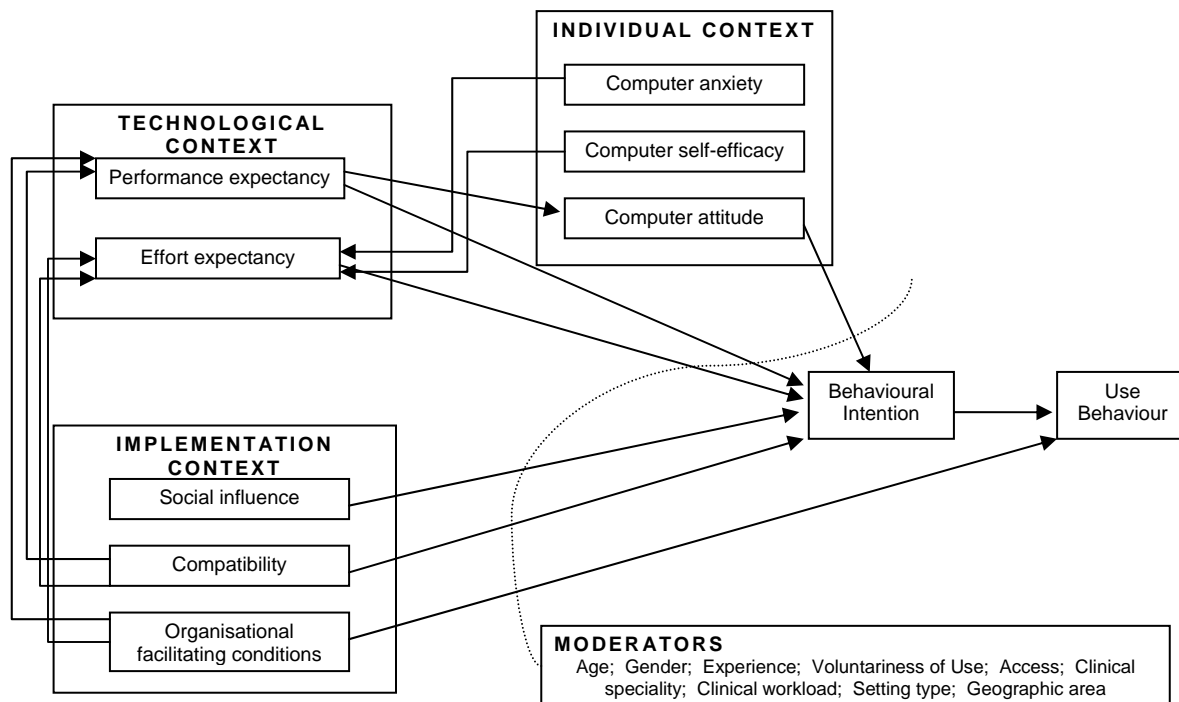

Figure 1. **Research Model**

THE CASE STUDY

This case study examines technology acceptance and use and the associated individual and organisational impacts within a small non-profit, community-based health care organisation. The study involved a longitudinal multi-method investigation of technology acceptance and use, collecting quantitative and qualitative data over a 7-month period as the organisation implemented a complete overhaul of their existing information system (IS) infrastructure.

The Organisation

Kids Are Kids Therapy and Education Inc (KaK) provide specialised therapy and education services for children and families. The mission of the organisation is to "provide a caring, trusting and holistic environment in which to work with children and their families to enhance family well being" (Kids Are Kids 2003). They aim to contribute to the overall development of children with educational and therapeutic needs in order to maximise inclusion into the mainstream education system and wider community.

KaK was established in 1997. It is an independent, not-for-profit, community-based organisation. The organisation consists of a Board of 11 members, a 3-person management team, 3 occupational therapists, 2 physiotherapists, 3 speech therapists, 1 psychologist, 1 therapy assistant, 3 administration personnel and numerous volunteers who manage the day to day operations of the organisation. Of the 16 paid staff members, only 5 are full-time employees.

KaK is entirely predominantly dependent on Government funding. They receive Federal, State and Local Government grants, which are reviewed each year. They also receive fees from fee-for-service clients, as well as memberships, donations and fundraising efforts.

Background to the KaK IS Implementation

In 2004 KaK was awarded a AU$40,000 Information Technology (IT) Grant. The purpose of this grant was to fund a complete overhaul of the existing IS infrastructure. KaK employed a consulting group to perform an independent needs

assessment, to review existing infrastructure and to recommend changes which were intended to support the long-term IT capability of the organisation.

Pre-Grant ICT Infrastructure

The pre-grant infrastructure at KaK was vastly inadequate and did not meet the organisation's needs. The entire organisation had only three computers which were running Windows 98, each with 64Mb RAM and 1 Gig hard drives. The main office was connected to the Internet via a single dial-up connection. Email accounts were individually paid for through the ISP and only one computer had access to the Internet and email. There was no network in place and no firewall structure. The inadequacy of the existing infrastructure meant that staff were often not able to gain physical access to a computer; were not able to share resources; most didn't have access to email or the Internet; and computers would often 'crash', resulting in lost changes to documents and inability to access previously stored work.

An Overview of the 'New System'

The IS implemented at KaK refers to the entire system, as changes were made to every aspect of the existing infrastructure. This included substantial changes to hardware, software, data and networks. The changes included 7 new workstations and 3 laptops (running Windows XP and the full Microsoft Office suite), an Exchange server, an internal network and a Broadband Internet connection for all computers.

The goal of the new IS was to transform the organisation and the existing processes. KaK underwent a major undertaking, installing all elements of the new system over a weekend. When staff returned to work on the Monday, they were given a 3-hour group training session and were faced with major changes to their computer and communications infrastructure and related processes.

METHODOLOGY

A longitudinal multi-method field study was designed to examine ICT acceptance and use and the associated individual and organisational impacts of use or non-use. Analysing user perceptions and behaviour longitudinally permits a detailed understanding of technology acceptance and use over time. This is consistent with prior technology acceptance research (Davis et al. 1989; Venkatesh et al. 2000; Venkatesh et al. 2003). The combination of quantitative and qualitative methods in information systems research, as opposed to only quantitative, is an important methodology consideration (Kaplan et al. 1988), and one that is noticeably infrequent in technology acceptance research. Collecting qualitative data recognises the importance of context, people and organisational issues in the use and acceptance of ICT; and the dynamic interaction between the constructs which may change over time. It also increases the robustness of results by permitting triangulation of the data and providing a deeper understanding of what is actually occurring (Kaplan et al. 1988).
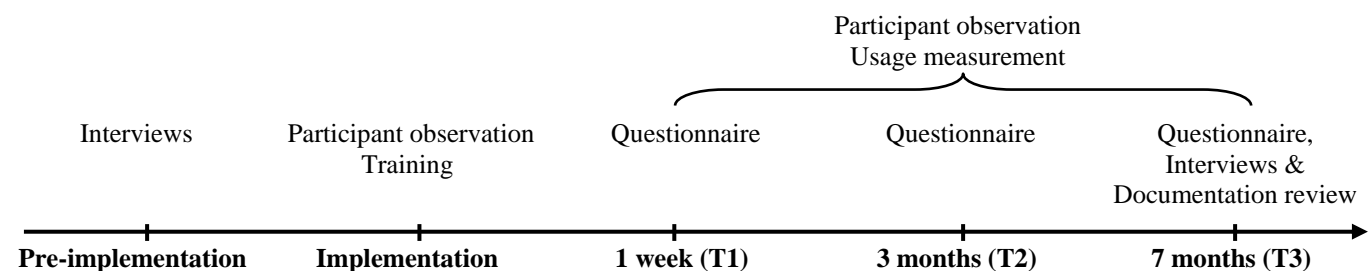

Figure 2. Longitudinal Data Collection Schedule

Data Collection

Data collection was longitudinal over a 7-month timeframe, timed in conjunction with the introduction and use of the new computer system at KaK. Methods of data collection included questionnaires, interviews with members of the organisation, participant observation and a review of documentation. In addition 'Time-use' software was employed to capture actual computer use by individuals. Figure 2 presents the longitudinal data collection schedule.

Questionnaires

The instrument developed for this research was modelled from the questionnaire developed by the authors for a national survey on ICT acceptance and use amongst Australian occupational therapists (Schaper et al. 2004a; Schaper et al. 2004b).

The questionnaire contained sections designed to capture information on: individual demographics and educational background; job characteristics; use of ICT at KaK; and questions on the new computer system including needs, benefits, expectations, concerns, and individual and organisational impact of the system. Questionnaire content was modified slightly at each administration point to reflect increasing levels of experience with the system. The final section of the questionnaire contained 35 items on a 7-point Likert scale designed to measure the model constructs. These remained constant at each administration point. The questionnaire was administered at three points in time: 1 week post-training (T1), three months post-implementation (T2) and seven months post-implementation (T3).

Interviews

Pre-implementation interviews were conducted with all staff who were willing to participate in this research. This included therapists, administration staff, management staff and a volunteer. Participants were asked a series of questions about their level of knowledge of the new system and what their expectations of the new system were. They were asked what their roles were at the organisation, their current use of ICT and what changes they envisage to the role of ICT in their daily work. They were also asked what their ICT needs are and if they had any concerns regarding the new system.

At the conclusion of this research (T3) interviews were conducted with all research participants to determine the relative success of the implementation. Participants were asked if their individual goals were met and asked to describe their use of the new system and its impact on them, the organisation and their work. Participants were also asked if they believe the organisational goals were met and what factors contributed to this. Questions were also asked on the problems encountered by individuals and the organisation during the 7 months since initial implementation and what they envisage for the future use of ICT at Kids Are Kids. Each interview was digitally recorded and transcribed.

Observation

Observation by the primary researcher occurred during the initial staff training session; occasional staff meetings, and management IT meetings; and various visits to the organisation throughout the research period.

Documentation Review

All documentation that related to the implementation and use of the new system was made available electronically to the researchers. The documentation reviewed included reports, meeting minutes and internal email communications.

Measuring Actual Use

To maximise the accuracy and comprehensiveness of actual computer use data collected throughout this research, Visual Timeanalyzer software was installed on each desktop and laptop computer. Visual Timeanalyzer is a time-use program which tracks all computer activities automatically and analyses these graphically (Neuber 2004). The organisation gave permission for this software to be installed for the duration of this research, and all staff were made aware of its presence on the system.

DATA ANALYSIS

All quantitative data was coded and entered into SPSS 12.0.1 (SPSS Inc 2003) for analysis. Qualitative data from interview transcriptions, interview notes and responses to open ended questions on the questionnaire were entered into NVivo (QSR International Pty Ltd 2002) and analysed as per analysis methodologies described by Miles & Huberman (1994).

RESULTS AND DISCUSSION

Of the 16 individuals employed at KaK, 14 consented to take part in this research. During the course of the study, 3 people resigned and the organisation created new positions and employed several new staff. This paper reports an analysis of responses from 9 staff, 8 of whom were at KaK for the entire duration of the research and 1 of whom started 5 weeks after implementation of the new system.

Technology Use

The use of ICT at KaK increased dramatically over the 7-month duration of this study. All participants reported an increase in frequency and extensiveness of use. While management staff reported a 30-5060-250% increase in their use of computers, therapists consistently reported a 15100-150% increase, as shown in Table 1.

Position	Pre-Implementation (% of work day)	Post-implementation (% of work day)	% increase
Therapy assistant	10	37	270
Therapist	10	25	150
Therapist	10	25	150
Therapist	15	30	10015
Mngmt/Therapist	30	60	10030
Mngmt	50	80	6030
Mngmt	20	70	25050

Notes:
1 - both measurements taken at 7 months post implementation
(n=7; N/A for person who started post-implementation; 1 not answered)

**Table 1. Staff perceptions of time spent using computers
pre- and post- implementation[1]**

As part of the new system the organisation provided individual email accounts for all staff and directed that staff use the calendar feature in MS Outlook. The summary data provided in Table 2 shows that 78% of participants have increased their use of email and MS Outlook calendar.

Participants use computers for a variety of clinical, administration and professional purposes. Since implementing the new system: 67% of participants have increased their use of computers during client interventions (i.e. as a tool in therapy); 78% have increased their use of ICT to communicate with clients and/or families; 67% have increased their use of computers to document client information and to schedule client appointments; and 56% have increased their use of ICT for continuing professional development and education. 100% of participants foresee an increase in the use of ICT in their work in the next 5 years and 88% believe ICT can add positive value to their work.

All staff have learnt new ways of using computers in their work. Examples observed by the researcher and reported by participants include: i) Clinical purposes, e.g. including digital photos and scanned images of a child's handwriting into a report that is saved in PDF format and emailed to the relevant external agencies; ii) Administrative purposes, e.g. utilising a laptop and data projector for staff meetings; and, iii) Therapeutic purposes, e.g. creating a PowerPoint presentation for a child as a motivating tool to improve hand-eye coordination and communication.

Prior to system implementation, Ian, a volunteer at KaK, began development of a client database. It was originally envisaged as an administration tool which would assist management by generating comprehensive reports needed to maintain and attract further funding. This database has evolved into 'TOTS' (KaK Therapy Online Tracking System) and is now used by all therapy and management staff. With further planned development, it will become a complete electronic client record.

Software / Program	Self-perceived Increase (9 staff)
TOTS (Kids Are Kids client management system)	8 (88.9%)
Organiser / calendar software	7 (77.8%)
Email	7 (77.8%)
Graphic programs eg Photoshop	6 (66.7%)
Word processing programs	4 (44.4%)
Presentation programs eg, PowerPoint	4 (44.4%)
Therapy related programs eg Boardmaker	2 (22.2%)
Spreadsheets eg Excel	2 (22.2%)
Financial & administrative systems eg MYOB	2 (22.2%)

Table 2. Staff Perceptions of Increased Use of Software

Technology Acceptance

Due to the small number of cases, statistical significance of the direct paths is unable to be determined, as is the impact of moderating variables. However, raw survey data and qualitative data collected during the course of the research lends support to the following constructs in the research model:

- Attitude - raw data from the questionnaire (T1 average (ave) = 6.09), in addition to observation and interviews, illustrates all participants to have a positive attitude towards the new system. The positive attitude of staff surprised one interviewee who stated *"(I'm) surprised staff have taken to it as well as they have. They've been really positive and taken it on board"*.

- Anxiety - participants reported varying levels of anxiety towards using the system and was not observed or reported (T1 ave = 2.88) to directly influence system use.

- Self-efficacy - The raw data (T1 ave = 4.47) indicates low-medium levels of computer self-efficacy for the majority of participants. This appeared to have little impact on use.

- Performance expectancy - A commonly cited benefit of the new system by staff is improvements in work productivity and efficiency (n=8, 88.8%). This was also reflected in the raw data on performance expectancy (T1 ave = 5.84).

- Effort expectancy - There was much variation within the organisation as to the pre-implementation level of ICT knowledge and skills. Some staff quickly became skilful while others continue to experience difficulty. However, this variation does not appear to effect use of the system and it is possible that the effort required to learn and use the system is not a reliable indication of use.

- Social influence - although not receiving a high raw score (T1 ave = 4.97), *"peer pressure…in a good way"*, was cited by an interviewee as a factor contributing to ICT use at KaK. Many interviewees also referenced the ability to ask other staff for assistance as a factor contributing to their use of the system.

- Compatibility - the research model hypothesises that compatibility, the degree to which an innovation is perceived as being consistent with the existing practices, values, needs and experiences of the health care professional, is a key variable influencing acceptance and use. In support of this, high scores were attributed to the raw data (T1 ave = 6.22). Qualitative data suggests that a key specific feature of the IS at KaK that impacted system use and outcomes are its ability to meet individual and organisational needs and to enhance staff ability to carry out their core functions and maintain the goals and objectives of service delivery.

- Organisational facilitating conditions - All interviewees attested to the support given to them by the management team. There was a unanimous belief that management *"did their best"*, were supportive and encouraging and made themselves available to assist staff and answer their questions. Again, this is reflected in the high raw data score (T1 ave = 5.78). Conversely, the provision of training, resources and time to gain the knowledge and skills necessary to use the new system is also a part of this construct. It was widely acknowledged by all interviewees that the training provided to staff was inadequate and that provisions should have been made for allocating staff time to learn the new system and to transfer their data. However, it is possible that these potential barriers to acceptance and use did not pose barriers due to other contributing factors, as outlined below.

Other Factors Which Contributed to Acceptance and Use of the 'New System'

Analysis of the richness of the qualitative data collected throughout the research period has revealed additional factors which contributed to acceptance and use of the new system.

- Gender - KaK is a female dominated organisation. With the exception of one volunteer (Ian) and a part-time psychologist (who was not available to take part in this study), all employees are female. While gender was not a focus of this study, it is hypothesised to be a moderating variable in the research model. It is important to note that allied-health organisations are often female dominated and this is an important factor to investigate in future acceptance research in the health sector.

- Although Ian's support could be included under OFC, it deserves separate mention. Ian's volunteer role at KaK has extended to a virtually full-time position. He is constantly on-hand to answer staff questions and to trouble-shoot technical problems. All staff have grown reliant on his presence and the CEO attributed the success of IS implementation to him. This attests as to the importance of IT support in contributing to use and acceptance.

- Computer access - access is a moderating variable in the research model. Although unable to be quantitatively measured, the majority of staff cited the ability to access a computer when needed as a key feature of their increased use of ICT.

- As a non-profit organisation, predominantly reliant on Government funding, all staff are acutely aware of the constant financial and resource constraints. As a result, staff were appreciative of their *"windfall"* and were excited about *"entering the Information Age"*; as one staff member stated *"if we don't have this, we don't have anything"*. This added to staff motivation to use the new system.

- Other individual characteristics. All participants were asked to describe why they and others persisted in their use of the system when faced with continual technical problems and other barriers. The responses were concisely captured by one who stated *"Bloody-mindedness!...We are all pretty persistent, dogged and determined. We've gone this far and we've made the commitment, and we (know) we can do it"*. These individual characteristics of persistence and determination may be worth including in future technology acceptance studies.

- Organisational culture. The structure and culture of an organisation may influence acceptance, use and IS success. This has been particularly evident at KaK. Although the organisational chart shows some hierarchy in the organisational structure, the organisation fosters a unique sense of community amongst staff and volunteers. They work as a team and often provide services as part of a multi-disciplinary team. All staff contribute to the decision-making process and can be involved as much, or as little as they choose, in the operations of the organisation. Acceptance and use of the new system was viewed by staff as an opportunity to enhance the service provided to KaK clients and their families and their motivation highlights staff commitment to the organisation, its missions and goals.

Many of the above factors were captured in the following statement…

> *"It's probably the nature and the underlying philosophy. We face constant challenges in everything we try to do - just getting this place up and running and keeping going. We've had knock backs and rejections and (people saying) 'well you're not supposed to be doing that', and we do it anyway; and (lots of) obstacles along the way. Because the core group of us are very strong and very committed to what we are doing ... we expect and anticipate that there are going to be problems, there are going to be obstacles... but that's the culture, in terms of 'fine' we'll take a break, take a breath and think 'ok' what are we going to do? We don't (think) 'oh its all too bloody hard' and give up. It's not in our nature... let's look at some good old fashioned OT-problem solving; and having that, we break it down (to what needs to be addressed and how can we do it, can we call on someone for help etc). (We have also managed to) link into people that can help us... deal with those difficulties and challenges."*

Many of these factors were not included in the original research model. It is recommended that future technology acceptance research and models be extended to include these variables.

Success of the IS implementation

A number of significant challenges occurred post-implementation, including: the fast pace of change; inadequate training provided to staff; no time given to staff to support their adjustment to and learning of the new system; and underdevelopment of policies, procedures and guidelines for use. They have also been plagued with technical problems which include a longer-than expected implementation period; an inadequate infrastructure; incorrect configuration of the network and consistent error messages and system crashes.

Despite these obstacles, the majority of participants stated their belief that the implementation had been successful, as indicated by: improved access, increased productivity, decreased stress, improved time management/efficiency, and staff acceptance and use.

Also important were the links between technology acceptance and use and the matching of organisational and individual goals. The individual goals of system implementation and use were closely aligned to the organisational goals. Although this did not appear deliberate, it further attests to the organisational culture, commitment and values of the organisation and the individuals it employs. The alignment of the goals fostered a sense of "we're all in this together" and ensured everyone aimed towards similar outcomes. This added to individual motivation to use the system and helped ensure the goals were achieved. This discovery is an important theoretical consideration and highlights the need for new theoretical developments in technology acceptance and outcomes. Linking and aligning individual and organisational goals to decrease resistance to change and improve organisational outcomes is discussed in organisational development and performance management literature but is an untested concept in the field of technology acceptance and use.

Organisational Outcomes

One of the outcomes of the acceptance and use of the new system at KaK has been the realisation of benefits. Despite the technical difficulties, staff at KaK perceive strong and ongoing benefits to them, the organisation and to their clients in continuing to use the information system. Participants cited a range of benefits of system use, of which they key ones were:

- Improved communication and responsiveness between KaK staff;

- Allowed a more integrated approach and better management of client records and associated documents;

- Increased organisation of, and access to, information;

- Increased the ability to analyse client data and service data;

- Increased productivity and efficiency;

- Improved the service provided to the client and their family;

- Increased accessibility to computers and Internet;

- Increased the consistency and cohesiveness in service provision; and

- Increased job satisfaction.

Other benefits mentioned include:

- Enabled an increase in the time spent with clients;

- Decreased amount of 'down time' (time unable to be charged);

- Reduced workload;

- Improved communication to external agencies;

- Experience of a personal sense of satisfaction, learning new ways of using ICT in the various clinical, administrative and therapy tasks;

- Enhanced security of information;

- Less individual stress;

- Provides the resources and tools for the organisation to produce their own brochures and information packs; and,

- The KaK website has also been improved, updated and maintained; and is promoted in their marketing efforts.

There is a shortage of allied health therapists within Australia. The management team at KaK are hopeful that this change to their IS infrastructure will act to give them competitive advantage in employing and retaining staff.

The IS will increasingly be used to decrease operational costs. For example, the Internet is being used as a tool to help produce resources; all photocopying and printing is done in-house; and staff are using email to communicate which has decreased expenditure on phone calls.

The focus at KaK is on the quality of service they provide to clients and their families. One of the major benefits of the IS cited by KaK management and staff is that the new system has provided a more consistent, cohesive, integrated approach to service provision and better management of client records and associated documents.

One of the unexpected outcomes is that acceptance and use of the system has contributed to changes in organisational culture. ICT is now seen as an essential tool and staff have become reliant on its use. IS failures have resulted in staff dissatisfaction and claims being made that they '*can't do their work*'.

CONCLUSION

This paper examines ICT acceptance and use and the associated individual and organisational impacts within a small non-profit, community based health care organisation. The case study described involved a longitudinal multi-method investigation, collecting quantitative and qualitative data over a 7-month period, timed in conjunction with the implementation of a new information system. The paper also presented a proposed research model of acceptance and use which is concurrently being validated amongst a sample of 2000+ health professionals.

Results from this study demonstrate qualitative support for the research model. The data elaborates on the constructs contained in the model to provide a comprehensive analysis of the factors influencing technology acceptance and use and the links between acceptance and use with the outcomes and impacts of use on individual and organisational goals. Results highlight the invaluable role of individual commitment to the organisation and to the matching of organisational and individual goals.

The significance of this work is that it proposes a thoroughly constructed research model which builds on work done by previous authors and extends this by linking acceptance and use to the associated outcomes. This work has highlighted the complexity of the constructs and relationships that influence technology acceptance and outcomes and shown the limitations of current models at understanding and describing this complexity. This work serves as a source for new insights into the field and has revealed a need for reconceptualising current models of technology acceptance and impacts. This work also has practical implications for IS professionals and health managers as it illustrates key factors influencing the success of IS implementations. Results also demonstrate the importance of qualitative methodologies in information systems research.

ACKNOWLEDGEMENTS

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