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Optimising User Acceptance of Mandated Mobile Health Systems (MHS): The ePOC (Electronic Point-of-Care) Project Experience

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Abstract

From a clinical perspective, the use of mobile technologies such as Personal Digital Assistants (PDAs) within hospital environments is not new. A paradigm shift however, is underway towards the acceptance and utility of such systems within community-based healthcare environments. Notwithstanding, introducing new technologies and associated work practices has intrinsic risks which must be addressed. In situations where end-users of a system are traditionally averse to technology through entrenched paper-based work practices (for example, community health workers), the process of managing change bears considerable determination in system implementation success. The authors propose a novel approach to end user acceptance within the context of a mandated mobile health system in a community health setting. The ePOC (electronic point-of-care) project is used to demonstrate how higher levels of user acceptance are achievable in these implementation environments where traditionally low levels of technology acceptance and use are common.

Keywords: User Acceptance, Mobile Health Systems, Mandated Technology Agile Systems Development

Introduction

A paradigm shift in community-based healthcare delivery is underway with regard to clinical information access and diffusion. Driving this shift in Australia is a dichotomy of increased demand for community-based healthcare services and e-health technology implementation initiatives such as the Electronic Health Record (EHR), Hospital Patient Administration System (HOSPAS) and Community Health Management Enterprise (CHIME). Mobile technologies which enable collection, delivery and exchange of timely information (both text and images) at the point of care have the potential to revolutionise healthcare delivery, leading to more efficient healthcare systems (NSW Health, 2001). However, effective management of the development and integration of systems with regard to end user acceptance is vital if the benefits offered by such technologies is to be realised. The challenge for Australian community health services, many of which rely on legacy and paper-based systems, is to map clinical pathways so that the beneficial aspects of electronic health information systems progress beyond the confines of traditional "bricks &

mortar" hospital infrastructure into increasingly essential point-of-care settings (Sargent *et al.,* 2006).
According to Lyytinen and Hirschiem (1987), the impact of well intentioned implementation projects has not always been looked upon favourably and many are destined to fail from the outset by not considering fundamental IT investment risks such as technical failure, data failure, user failure and organizational failure. In this paper we describe a technology-user-management matrix approach to system design, development and implementation in an attempt to redress user failure and enhance user acceptance. The approach we present will ultimately enable point of care clinicians to embrace work practice challenges as Health transforms to *eHealth* defined by Eysenbach (2001) as "*an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies"* (Eysenbach, 2001). With any new technology 'an element of uncertainty exists in the minds of decision makers with respect to the successful adoption of them' (Bagozzi *et al*., 1992). According to Rogers (1995, cited in Toleman et al., 2004), the adoption process is defined as 'the process through which an individual or other decision making unit passes from knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea and to confirmation of this decision'. This is supported by Toleman et al. (2004) who suggest that 'adoption takes place through a sequence of stages through which a potential adopter of an innovation passes before accepting the innovation'. The *e*POC approach to user acceptance leverages on this premise, taking the stance that user acceptance should be addressed at each stage in the adoption process to maximise user acceptance of delivered systems.

Failure to handle the people side of a new system correctly has turned many technically sound systems into implementation failures (McNurlin and Sprague, 2005). Therefore, an understanding and appreciation of the myriad implications of electronic point-of-care systems upon clinicians, the intended users of these systems is essential. The authors contend that, for small, site-specific electronic health IS development projects, higher levels of user acceptance of delivered systems and therefore, successful implementation, can be achieved by applying concepts derived from Agile system development to user acceptance. Such an approach offers the potential to improve levels of end-user acceptance by allaying fears over ill-fitting, poorly designed systems, where anecdotal evidence purports end users being 'lumped' with systems that fail to meet their particular needs. In addition, the decision to adopt the proposed approach provides end users with a sense of system ownership, similar to Krall's (1998) concept of clinician "buy in".

In the study detailed in this paper, enhanced levels of user acceptance have been achieved by taking six core principles of Agile development (specifically, Dynamic Systems Development Methodology (DSDM)), and mapping these to user acceptance measurement from project initiation to implementation. The central tenet of this approach is enabling a "best fit" solution for the end-user (clinician) as well as the provider organisation. The contribution of this paper is focused towards a better understanding of the implications of mandated mobile health systems, its acceptance and ultimately, use.

Theoretical Basis of the Study

Extensive research on user intentions to adopt new technologies exists, however, much of this research has been conducted in implementation environments where adoption is voluntary as opposed to mandated (Brown et al., 2002). A voluntary use environment is defined as "one in which users perceive the technology adoption or use to be a willful choice: a mandated environment is where users perceive use to be organizationally compulsory" (ibid.). Brown *et al*. (2002) go on to suggest that in these environments, the new system must be used to complete job tasks that are tightly integrated with the tasks of multiple workers and stress that impressions may also exist whereby any form of consultative input from end users is inherently removed, leaving end users' disillusioned with the system.

The approach taken in this study is not intended as a substitute for traditional technology acceptance models. Rather, it should be viewed as tangential upon the overall theme of user

acceptance. The results of the research undertaken, support the acknowledged hypotheses of the Technology Acceptance Model (TAM) and the Theory of Reasoned Action (TRA), yet goes further by seeking to illustrate improved deliverability of mobile health systems, particularly, mandated systems. The project detailed in this paper, uses an iterative approach consistent with the premise of Agile development methodology and assesses user perceptions of the proposed system at regular points throughout the system development lifecycle. A continuous consultative approach with staff at the research site, along with regular user surveys and focus groups enabled the project team to intervene at critical points throughout the system development lifecycle, with the intention of allaying clinician concerns over the proposed system. The aim of this process is to enhance user acceptance with a goal of achieving 100% acceptance of the delivered system. The process is consistent with Davis and Venkatesh's (2004) premise of "preprototyping user acceptance".

Extant research into technology acceptance has demonstrated the ability to successfully predict system success only after users have acquired significant direct experience with a system. Socio-cognitive models such as TAM (Davis, 1985) and TRA (Azjen and Fishbein, 1980) aim to predict end user adoption and acceptance of information systems (IS). Both models assume that given sufficient time and knowledge about a particular behavioural activity, an individual's intention will closely resemble how they actually behave (Rawstorne et al., 2000). Rawstorne though, contends that the TRA is ill equipped to predict situations in which individuals have low levels of volitional control as described by Azjen (Azjen, 1985). This convention is important considering that the technology implementation upon which this current study is based is a mandated implementation.

Davis and Venkatesh (2004) state that it is possible to predict the degree of post implementation user acceptance "before writing a single line of code, possibly before even building a working prototype". They go on to propose that "researchers should investigate better ways to perform such "prototype user acceptance testing". Taking the point further, they ask "Can predicatively accurate assessments of the likelihood of workplace acceptance of a new system be made based on measures taken from prospective users who have been informed about the features and functionalities to be included in the new system, but have not yet had an opportunity to experience hands on interaction with it". The current research seeks to determine just that.

From the outset, the research approach adopted by the ePOC project has centred around a consultative, open approach with all project team members, in particular, area health managers (Clinical, Research and IT), and the intended end users (TACT Medical Director, Doctors, Nurses and Para-Health Professionals) of the system. To facilitate this approach, the ePOC project incorporates a number of research and development phases. The approach to user acceptance developed during the ePOC project is supported by Davis andVenkatesh (2004), who suggest that taking an interative, consultative approach helps "focus upon the identification, correction and prevention of requirements errors that have been introduced in the original specification of requirements" (ibid.).

A fundamental differentiation between variants of technology acceptance models and the approach proposed in this paper is the factor of time in which review of the health system being studied occurs. TAM and the extended TAM (eTAM) are tools which have been used to evaluate the perceived ease of use of technologies (such as PDAs) however, the time when the process of managing a system adoption occurs is made by reviewing prior actual adoptions, investigating variance of perceptions and applying results to subsequent implementations. Liang et al's., (2003) study using eTAM to predict actual PDA usage among healthcare professionals is an example of this approach. Davis and Venkatesh (2004) hypothesise that stable and representative measures of perceived usefulness only requires that potential users be informed of what a system will be designed to do, that is, intended functionality, and do not require hands on interaction with a working system. The results from the ePOC project indicate that this hypothesis may not be supported in the context of mandated mobile health systems.

Research Environment

The *Electronic* Point of Care (*e*POC)

The *e*POC Project is a multi-phase, collaborative research and development project. Research partners include the University of Wollongong, Flinders University, University of South Australia, South Eastern Sydney Illawarra Area Health Service (SESIAHS), The Ambulatory Care Team (the client), Northern Illawarra and Pen Computer Systems Pty Ltd, a leading Australian health informatics company. The project client is The Ambulatory Care Team (TACT), Northern Illawarra.

The *e*POC project is developing an integrated Ambulatory Care Information System (ACIS) to be deployed on a Personal Digital Assistant (PDA) platform. A PDA-based point-of-care health system is significant in that it will provide for collection, delivery and exchange of timely information (both text and images) at the point-of-care, leading to a more efficient healthcare system. Effective healthcare delivery within community based health services depend upon efficient information access (NSW Health Information Management and IT Strategic Plan, 2001). The philosophy of the project is to utilise generic, reusable and scalable components that have the capacity to exchange or send patient data between legacy area health systems (such as hospital or community, patient, pathology, radiology and medical reference database systems) via a suite of HL7 (Health Level 7, version 3) compliant middleware. The key advantage of a PDA-based system is its high mobility and flexibility in matching complex healthcare workflow requirements as well as immediate updating of healthcare records at the point-of-care. Such a system has the potential to save people's lives or at least significantly improve their health outcomes by responding more quickly and with more appropriate interventions.

Community based health services in New South Wales (NSW), Australia, currently deliver over eight million occasions of service per annum. These services are provided by more than 7,000 clinicians from more than eight hundred and fifty health service locations across NSW. The cost of this service is estimated to be almost $450 million dollars per annum (NSW Health CHIME overview). The Ambulatory Care Team (TACT) Northern Illawarra is one such area health initiative, based on providing patients with a choice of having treatment in their usual place of residence (including aged care facilities) or other locations as an alternative to hospital. The TACT team is a small unit with 21 staff members consisting of 3 Doctors (including the team's Medical Director), 1 Nurse Manager, 13 Nurses (4 full-time and 9 part-time), 1 Physiotherapist, 2 Pharmacists and 1 COPD.

In 2004, TACT Northern Illawarra provided medical, nursing and Allied health professional services (such as physiotherapy and pharmacy services) to more than 1300 patients, with an average of 114.4 separations (discharges) per month. TACT receives referrals from several sources: Hospitals, General Practitioners, Visiting Medical officers and Staff Specialists and Peri Operative Clinics. The population of the Northern Illawarra is expected to reach in excess of 340,000 residents by 2026 (DIPR, 2004), placing increasing demand on community based health services

Towards a User Acceptance framework for Mobile Health Systems

As previously stated, the user acceptance approach adopted in the *e*POC project is not intended as a substitute for traditional technology acceptance models. Rather, it should be viewed as tangential upon the overall theme of user acceptance. The *e*POC approach to user acceptance supports the acknowledged hypotheses of TAM (Davis, 1985) and TRA (Azjen, 1991), however, goes further by seeking to illustrate deliverability of information systems (particularly mandated mobile health systems) and addresses the core concept of 'many behaviours pose difficulties of execution that may limit volitional control. As each system development project is unique and context specific, the system development methodology and user acceptance model adopted should be grounded in the context within which it is applied. Leveraging on this philosophy, the *e*POC project has

adopted an Agile (DSDM) approach for the development of the Ambulatory Care Information System (ACIS). The ePOC user acceptance approach is derived from six of the nine core DSDM principles. Dynamic Systems Development Methodology is a framework supported by its continuous user involvement in an iterative and incremental development approach which is responsive to changing requirements, in order to develop a system that meets the business needs on time and within budget. It is one of a suite of agile methods for developing software and forms part of the Agile Alliance (Wade and Schneberger, 2006).

The following six principles of DSDM are the focus of the approach used in the ePOC project:

- Active user involvement
  - TACT management and clinicians participate in Questionnaires, Focus Groups and Question and Answer (Q&A) sessions. Project updates in the form of short newsletters are provided to clinicians at frequent intervals and all TACT staff are encouraged to provide feedback on any aspect of the project to the steering committee.
- A focus on frequent delivery of products
  - A modular approach to delivering components of the ePOC system is integral to *e*POC. 'Products' of the *e*POC system may include a distinct functional unit or value added component, eg. the delivery of a Graphical User Interface (GUI) specifically for collecting Clinical Observation data or installation of the Monthly Index of Medical Specialties (MIMS) onto the PDA device.
- Iterative and incremental development to ensure convergence on an accurate business solution
  - This forms the basis of the *e*POC approach to user acceptance and is described further throughout this paper.
- Reversible changes during development
  - The ability to change a system component or project management technique proactively is used by the *e*POC project team to minimalise delays throughout the project lifecycle.
- Integrated testing throughout the lifecycle
  - A key component of the iterative, consultative approach adopted by the *e*POC project team
- Collaboration and co-operation between all stakeholders
  - Operationalised by focusing on an iterative and consultative approach.

Another fundamental difference between variants of the technology acceptance models detailed above and the approach taken by *e*POC is the time factor in which review of the information system being studied occurs. User acceptance assessment using TAM and its extension (eTAM) takes place by reviewing prior actual adoptions, investigating variance of perceptions and applying the results to subsequent implementations. Liang *et al's* study of the use of eTAM to predict actual PDA usage among healthcare professionals is an example of this traditional 'review past implementations, apply findings to new/next implementation' technology acceptance approach (Liang *et al.,* 2003). The philosophy of the *e*POC approach to user acceptance is unique, in that user perception of, and intention to use the point-of-care system is assessed at critical points (when each additional module is added to the system or concerns over the system are raised by users) in its development and is closely aligned with delivery, testing and modification of each system component (See Figure 4, below).

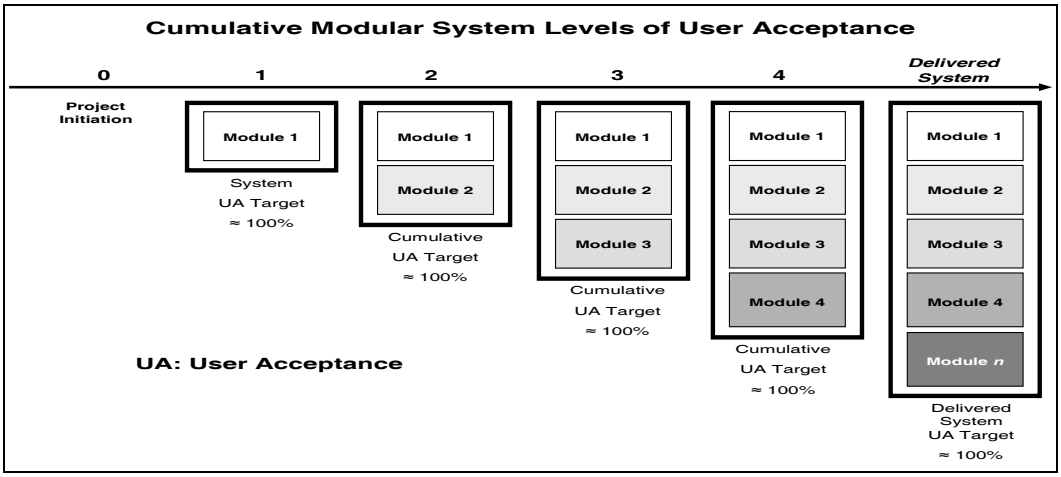

Figure 4: *ePOC Approach to User Acceptance (Module 1 = Clinical Observations, Module 2 = Peripheral and Central Line Checklists,Module 3 = Electronic Protocols, Module 4 = MIMS)*

The *e*POC approach is consistent with Toleman *et al's* assertion that perception 'takes place through a sequence of stages through which a potential adopter of an innovation passes before accepting the innovation' (Toleman *et al.,* 2004). Three levels of perception in regard to proposed technology implementation in healthcare settings must be acknowledged to achieve best fit: perceptions at the organizational level (government health departments), at the service level (community health settings) and at the end-user level (clinicians). At the organizational level, the New South Wales Department of Health has demonstrated its support of *e*health applications by investing in CHIME (Community Health Information Management Enterprise). In line with this commitment, the Department has dedicated significant resources to the development of an Electronic Medical Record (EMR). *e*Health is high on the agenda, and South Eastern Sydney Illawarra Area Health Service (SESIAHS) has adopted this philosophy.

At the service level (SESIAHS), health technology is already prominent in clinical applications, such as the Picture Archiving Communication System (PACS), considered to be a state-of-the-art e-health system. At the end user level, systems such as the proposed *e*POC system are currently receiving attention. In the current public health environment of limited resources, one option is to increase clinician output using the same level of resources with a view to increasing efficiency. Thus, having an *e*POC system is one way of potentially meeting this challenge. From an end-user perspective, an *electronic* point-of-care system provides the means by which a multitude of information sources can be utilised to determine the correct course of action for the current episode of care delivered to a patient. Further, mobile health systems enable the clinician to perform a wide range of clinical functions, empowering them at the point of care. It is an imperative therefore, that user perceptions towards such systems are positive, leading to greater acceptance and ultimately, system use.

Within the *e*POC project, system development and user acceptance measurement occur in tandem (as depicted in Figure 5), throughout the system development lifespan and involves regular interventions (via provision of supplementary services such as consultation, training and technical support) triggered through field trials, focus groups and surveys. Clinicians are also actively encouraged to discuss any concerns they have regarding the proposed system with the research team. To add value to the approach, this is combined with the use of less formal interaction between the project team and users, through discussion forums, workshops and information provision via the project website and a staff notice board at the client site.

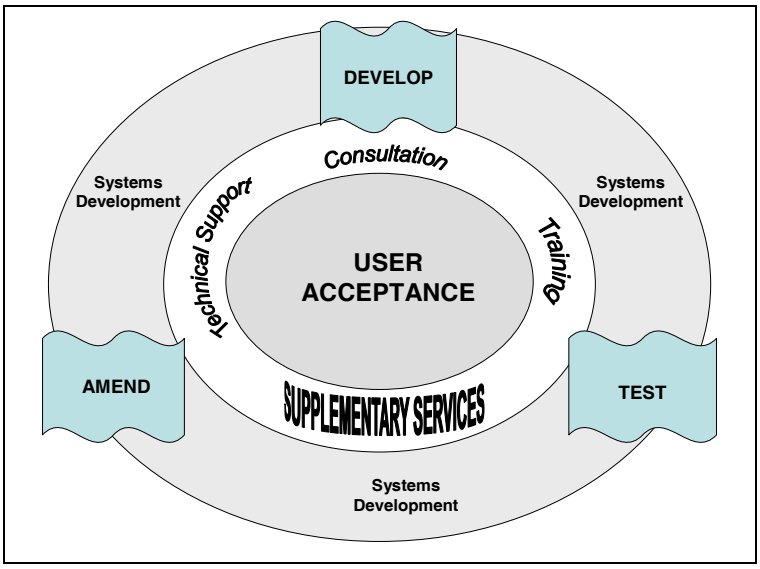

Figure 5: *System Development and User Acceptance Process*

Survey Instrument Development

Kline's Groupware Adoption Scale (2001) formed the basis from which the user survey was developed. Kline's scale was developed for the purpose of measuring user acceptance of mandated information systems and was adapted to meet the specific needs of the *e*POC project. Kline's six original subscales (EOU, Technical Support, Training, Work Needs Met, System Capabilities and Consultation) were incorporated into the instrument. Three commitment items included in Kline's scale to assess employee commitment to using the system were also utilised in the questionnaire. A seventh subscale, Persuasion was incorporated after the first survey and focus group. A five point Likert format with responses ranging from 'agree completely' to 'disagree completely' with a neutral midpoint was used.

The aim of the questionnaire was to: 1) gauge the perceptions of end users towards the *e*POC project and proposed ACIS 2) assess their perceptions of the PDA device as the platform of choice for the deployment of the system, 3) to test the utility of the instrument and 4) test the proposal by Davis and Venkatesh (2004), whether 'predictively accurate assessments of the likelihood of workplace acceptance of a new system can be made based on measures taken from prospective users who have been informed about features approved and functionalities to be included in the new system, but have not yet had an opportunity to experience hands on interaction with it'.

Prior to the start of the project both the University and Regional Health Service gained ethical clearance to undertake research with the TACT staff. In addition, a number of meetings regarding the proposed project and ACIS were held with the TACT Medical Director and Nurse Unit Manager prior to the initial survey and prior to users at the client site being exposed to and/or having 'hands on' experience with the PDA device.

Phase one of the research involved distribution of the questionnaire to 21 TACT staff who had all previously agreed to participate voluntarily and anonymously. All 21 questionnaires were completed and returned, constituting a 100% response rate. Data from the survey was entered into a spreadsheet application and analysed. Results from the five surveys and sequencing of each in respect to points of intervention by the project team are detailed in Table 1. Intervention involved a combination of workshops, information sessions and training. Individual results for each of the eight subscales obtained from the five surveys are presented and discussed below.

Results and Discussion

Preliminary analysis of the survey data from the initial survey (questionnaire), following information sessions on the proposed system revealed a trend by respondents to take a neutral standpoint (ie. neither agree or disagree) on the majority of survey questions.

The results across the majority of the subscales, although promising, were well below the project target (ie. close to 100%). The subscale of most concern was system capabilities with an acceptance rate of only 62%. A focus group interview following the survey revealed that staff at the Unit had misinterpreted the Medical Director and Nurse Unit Manager's own lack of understanding of the capabilities of the proposed system as a lack of their commitment to the proposed system. This had a negative impact on user perceptions of the potential of the system in improving the efficiency and effectiveness of the Unit. Notwithstanding, overall user acceptance following the first survey was reasonable (77%). As stated earlier, it was considered imperative to the overall success of the *e*POC project that management at the Unit demonstrate a positive attitude and commitment to the proposed system to encourage acceptance by clinicians and other users. At this point, a project 'refocus' ensued with the project team's response being to adopt an Agile approach to user acceptance as well as system development. This involved meetings with all staff at the Unit, a series of workshops and information provision via the project website and notice board dedicated to the project at the client site. Users were also given the opportunity to contact the project team directly if they had any questions regarding the project, the system under development or use of the PDA device. In addition, a project champion (TACT Medical Director) was appointed to drive the project at the client site. An eighth subscale, persuasion was included in the questionnaire to determine if the appointment of the project champion would have a direct, positive effect on user perceptions of the system.

	Ease of Use	Training	Technical Support	Consultation	Work Needs Met	System Capabilities	Commitment	Persuasion
Survey 1								
Proposed System	71%	84%	86%	76%	72%	62%	87%	N/A
Intervention 1								
Survey 2								
Proposed System	89%	98%	100%	93%	86%	86%	100%	87%
Field Trial 1								
Survey 3								
Module 1 and 2	83%	54%	83%	50%	61%	71%	84%	67%
Intervention 2								
Field Trial 2								
Survey 4								
Module 3	94%	88%	100%	100%	89%	91%	100%	87%
Field Trial 3								
Survey 5								
Module 4	90%	91%	96%	90%	84%	88%	93%	90%

Table 1: *Survey Results*

Following the intervention, a second survey was conducted and the results analysed to determine if, as a result of the project team's intervention and the new approach taken, users would respond more positively to the system. It is clear from the results that the intervention had a positive impact on user perception, evidenced in an overall increase in user acceptance from 77% to 92% providing 'proof of concept' of the approach taken. Positive user perceptions across all 8 subscales is evident, with the most notable being Perceived System Capabilities (24%), one of the key constructs targeted in the first intervention. This result is attributed to the workshops and information sessions on the proposed system capabilities which assisted in addressing user concerns in regard to whether the ACIS would be capable of improving efficiency of staff at the

Unit and meeting their work needs when implemented. Following the second survey, TACT staff were issued with PDA devices and given time to familiarise with them prior to development and implementation of the first system module. They were also provided with training in the use of the device on request. The initial modules developed and tested was Clinical Observations and Peripheral Line Checklist. Each module was developed by taking into account existing paper-based information requirements in addition to user interface design considerations and workflow improvements. The prototype Clinical Observations and Peripheral Line Checklist was then tested in a field trial to determine if the modules met expectations at point-of-care. Examination of the data from the third survey (conducted after the field trial) revealed that user acceptance of the system decreased across all 8 subscales.

The two areas of greatest concern identified in the survey were Training, which dropped from 98% in the second survey to just 54% and Consultation which fell from 93% to 50%. This result was attributed to the fact that the majority of staff participating in the field trial had not 'used' the PDA device, read the training manual provided by the project team or requested individual training in the use of the device. Despite technical support being provided throughout the trial, staff had difficulty with both the device and the system component. The issues surrounding training and consultation had arisen partly because of the fact that new staff had commenced at the Unit and had not been involved in the information sessions, workshops and preliminary training sessions. Work Needs Met and Persuasion also fell from 86% to 61% and 87% to 67% respectively. The drop in Persuasion was surprising given that the project champion had been appointed at the project site to drive the project. A focus group that followed the trial also highlighted a number of design issues related to the system and the user interface. As a result, the modules were modified. The results of a next survey (conducted after modifications were implemented) indicate that users were much more satisfied with the first two modules after their concerns were addressed. Lessons learned from earlier surveys, focus groups and interventions were incorporated into the design of Module 3, Electronic Protocols. Following implementation of the module onto the PDA device, a fourth survey was conducted.

The results of the fourth survey were very positive (and a major improvement on survey three results) with acceptance levels reaching the highest recorded to date. One hundred percent (100%) acceptance rates were recorded for Technical Support, Consultation and Commitment, with each of the other six subscales above eighty five percent (85%) acceptance. Intervention by the project team at critical points in the delivery of the earlier system components had an obvious impact on user acceptance of the ACIS, providing further support for the user acceptance approach taken by the project team. Following implementation and trial of Module 4 (MIMS), staff at TACT were surveyed for a fifth time. User perceptions across six of the nine subscales (Ease of Use, Technical Support, Consultation, Work Needs Met, System Capabilities and Commitment) fell below that recorded in the previous survey, triggering further intervention. On this occasion, intervention involved a redesign of the MIMS interface, a change in the availability of technical support to better fit with staff hours of employment, more targeted consultation (one-on-one as opposed to groups), a re-examination and refocus of system requirements in terms of meeting staff work needs, and a greater demonstration of commitment to the system by management at the Unit. Concerns over the results of the final survey and therefore the success of the delivered ACIS prompted the project team to convene another focus group to gain a better understanding of the issues highlighted in the survey and to enable further intervention and refinement of Module 4 before the final implementation of the ACIS. The focus group revealed that staff at the Unit involved in the latest field trial had major concerns over how well the system actually met their work needs and improved efficiency in carrying out their duties at the point of care. This came about due to organisational concerns rather than concerns over the system itself. In a climate of decreasing funding for public healthcare and where clinicians are increasingly being asked to do more with less, staff became concerned that the introduction of the ACIS would mean more pressure on burgeoning workloads. Due to the negative impact that this could have on them so they had erred on the side of caution when completing the survey. The major outcome from the focus group is that staff at TACT are in fact extremely satisfied with the system and its capabilities.

Conclusion

The results of the study support the viability of the approach to user acceptance taken in the *e*POC project. Involving users in system design from initiation to implementation has demonstrated benefits. Taking this concept a step further and applying it to user acceptance measurement throughout the system development lifecycle assists in ensuring higher levels of user satisfaction with functionality and utility, and therefore, acceptance of delivered systems. Measuring user acceptance throughout the system development lifecycle, rather than post-implementation provides developers with an opportunity to intervene to address user concerns at critical points as they arise, making it easier and more cost effective to modify system components to better meet user needs. The authors believe that it is possible to optimise user acceptance of mandated mobile health systems by adopting the approach proposed in this paper. Due to the small sample size, it has not been possible to conduct empirical research to validate the data collection instrument used in the *e*POC study. Future research will however, further develop, test and validate the proposed user acceptance approach and scale in an enterprise-wide system development and implementation, leading to the development of a comprehensive user acceptance framework for mandated mobile health information systems. It is conceivable that the approach to user acceptance detailed in this paper can be applied with success to other systems development projects that utilise component-based system design and development methodologies.

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Appendix – ePOC User Acceptance Scale

All responses take the form of a likert-type scale with numbers indicating:
1 = disagree completely, 2 = disagree somewhat, 3 = neither agree nor disagree, 4 = agree somewhat, 5 = agree completely

Ease of Use

1. If an ePOC system was used by TACT, I am confident I could learn to use the system easily
2. I am confident I would be able to transfer my knowledge of TACTs current systems easily to the ePOC system
3. An ePOC system has the potential to significantly reduce the time taken to perform a task that is currently done manually

4. Training

5. If an ePOC system was introduced into TACT and that required regular training, I would be willing to be retrained
6. I would require dedicated time for formal training in using an ePOC system
7. I would require dedicated time for ongoing training in using the ePOC system

Technical Support

8. If I have difficulties in using the new system then the technical support personnel should be easy to reach at any time
9. If I have technical difficulties in learning the new system then the technical support personnel should respond in a timely manner

Consultation

10. I will be consulted adequately about my needs as a user of the ePOC system before the decision to adopt the new system is made
11. I will be asked whether the ePOC system is meeting my expectations
12. Any concerns I have about the ePOC system should be considered before the decision to adopt the system is made

Work Need Met

13. The ePOC system should allow me to accomplish more work in the same time frame
14. The ePOC system should enhance the quality of my work
15. The ePOC system should save me time

System Capabilities

16. The ePOC system should allow me to meet imposed work commitments
17. The ePOC system should increase my capacity to carry out my work
18. The ePOC system should be reliable (does not crash)
19. The ePOC system's software will be reliable (does not crash)
20. The ePOC system's software should be powerful enough for my work needs
21. The ePOC system's software will be powerful enough for my work need

Commitment

22. If TACT introduced ePOC I would use it
23. If TACT introduced ePOC then I would be committed to learning to use the new system

Persuasion

24. TACT management is actively promoting the benefits of ePOC
25. I am confident TACT managers will encourage me to use the ePOC system when implemented