Project Management and Planning Issues Confronting Collaborative Research Projects: A Case Study in eHealth

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Abstract: This paper describes the first hand experiences of the electronic point of care (ePOC) project team and the project management and research and development issues that emerged over the course of a collaborative 3 year eHealth project. The paper highlights that despite the best of intentions by project managers, researchers and developers, a technologically innovative concept is no guarantee of project success. Issues beyond the project team’s control that occurred during the life of the ePOC project included industry partner restructures, changes in data feeder systems and evolving health messaging standards. A series of proactive mitigation strategies deployed by the project team illustrate how the process of adopting a dynamic systems project management approach can help address unforeseen issues as they arise and derive maximum benefits to all stakeholders.

1 Introduction

Despite good intentions and careful project management, management scenarios present themselves throughout the course of Research and Development (R&D) projects where a dichotomy emerges at the boundary between building the system (including user acceptance testing of prototypes) and the diffusion of technology into an enterprise environment. A well planned, well managed project is no guarantee of success in modern systems analysis and design. The greater the number of project variables and partners, the greater the potential for unforeseen issues arising during the course of a R&D project. Such scenarios can result in a dichotomy between information systems and technical issues and are indicative of collaborative research projects where significant ‘product’ development occurs in an academic environment alongside an opportunity for real-time, embedded testing in their actual (or intended) enterprise setting. Several categories of R&D projects meet this criteria with Health and Defence the most obvious examples due to their inherent privacy and security similarities, associated with the process of accessing data of a restricted or sensitive nature often around a legal and ethical framework. Such collaborative R&D scenarios will likely continue (Government, Academic and Private Industry collaboration), therefore the question should be asked
“What should project managers be aware of when managing such projects and what can be done to lessen the likelihood of issues specific to such collaborations arising?” Only once this question is addressed can effective strategies be put in place to ease the dichotomy that presently exists and offer subsequent projects the maximum potential of successful outcomes for all stakeholders.

This paper reflects on the project management experiences of the electronic point of care (ePOC) project team over the course of a 3 year Personal Digital Assistant (PDA) based Ambulatory Care eHealth project. Although the research setting is Australian and the context eHealth, the experiences are universal and as such the authors intend this paper as a ‘cautionary tale’ for project managers, systems developers and researchers who may be about to embark upon a similar journey. A distinguishing feature of this paper is the way it is presented; using a descriptive/narrative format that enables the authors to ‘set the scene’ in describing how a technically innovative eHealth project can be impacted by an assortment of predominantly non-technical issues; particularly organizational change [Wi01]. Unforseen issues that arose for the ePOC project team are discussed throughout this paper. These include:

- Organisational restructures within the client and academic partners;
- Key personnel departing the project team throughout its lifecycle;
- Subsequent dynamic delegation of team roles and responsibilities;
- Realignment of service-level client setting from Community Health to a centralised Hospital setting;
- Changes in data feeder systems - impacting on feeder system interoperability;
- No minimum data set for Ambulatory Care for the applicable jurisdiction from which the project could draw data from;
- The need to be cognoscente of institutional mindsets by the project team;
- Dynamic evolution and adoption of competing health messaging standards; and
- The present global transformation from Health to eHealth.

The paper concludes with a discussion on mitigation strategies and the adoption of a Dynamic Systems Project Management approach which the ePOC project team utilised in dealing with these issues.

2 The ePOC PDA Project

2.1 Background

The ePOC PDA project is a Personal Digital Assistant based point-of-care Ambulatory Care information system. The project client, TACT (The Ambulatory Care Team), provides 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 unit consists of 21 staff members: 3 Doctors (including a Medical Director), 1 Nurse Unit Manager, 13 Nurses, 2 Pharmacists, 1 Physiotherapist and 1 Chronic Obstructive Pulmonary Disease coordinator. The project is fully-funded for 3 years
through an Australian Research Council (ARC) Linkage Scheme. Researchers are drawn from 3 Australian universities; the University of Wollongong, Flinders University and the University of South Australia. South Eastern Sydney Illawarra Area Health Service (SESIAHS) is the health partner, while Pen Computer Systems Pty Ltd, a leading Australian-based health informatics company, is the technical partner.

### 2.2 Problem Definition for Electronic Point of Care Data Collection

The project was initiated to address fundamental data access, clinician empowerment and patient (client) care improvements at the point-of-care. Presently, a majority of TACT information systems are paper-based and are limited to what the healthcare worker can effectively carry. The utility of the PDA device makes it ideal as an electronic replacement for many paper-based TACT systems. These systems, such as treatment protocols, street directory and assorted medical reference material converge onto a single device: the PDA. The problem definition manifests when the intricacies of transitioning from paper-based systems to electronic-based systems are considered within the context of the information architecture in which TACT finds itself. This is shown in Illustration 1 and further described below.

![Illustration 1: Duplication of Data: Transitioning from Electronic to Paper-based systems](image)

Community Acute and Post Acute Care (CAPAC) health services such as Ambulatory Care transfer the setting of patient care from hospital to point of care when the
seriousness of the condition is warranted. Ambulatory Care is based on a healthcare delivery model of providing episodes of care to decentralised hospital outpatients; in the patient’s own home. The information management model utilised by CAPAC service providers such as TACT is centralised. A patient’s Electronic Medical Record (EMR) is only accessible by a TACT clinician while the clinician is located within the wired hospital network architecture, yet the treatment of the patient (based on reference to the EMR) occurs away from such wired architecture. This misalignment of models is problematic because it creates inefficiencies and duplication in regards to clinical information access and diffusion.

3 The ePOC Experience – Considerations and Consequences

3.1 Organizational Restructures of Project Partners

Organisational Restructures have the potential for positive and negative impacts on projects. Anecdotally, the negative impacts often receive the most attention. In New South Wales, health services are geographically divided into Area Health Services and the provision of healthcare is a State (not Federal) Government responsibility. The ePOC project health partner, during the grant submission/project funding phase and initial first 6 months of actual project work was the Illawarra Area Health Service (IAHS). This service is centred on the City and surrounds of Wollongong (population approx 200,000). In January 2005 IAHS merged with South Eastern Sydney Area Health Service (SESAHS) to form SESIAHS. Such restructuring within industry sectors is nothing new. However, the eventual impact of the restructure upon the ePOC project was underestimated and impacted the project in the following ways:

As the designated Health signatory of the joint research grant application no longer held the position post the restructure, the project team had to comprehensively brief the newly appointed Chief Executive Officer of the new area health service. In the overall scheme of things the ePOC project was perhaps regarded as just one of a number of molehills that formed the mountain of responsibilities of the new area health service’s CEO. In the eyes of the ePOC project team however the significance of having support for the project reiterated by the newly appointed CEO was vital to maintaining its research momentum and moving the project team / end user relationship forward. The restructure also necessitated the appointment of a new head of research for the amalgamated area health service. The process of replacing a project partner on a Federal Government grant was an administrative function for the project which took time so as to meet the standard protocols and framework of Australian Federal grant funding. Such experiences are not new to the field of project management. However, a number of repercussions were to materialise as a result of the organizational restructure.
3.1.1 Subsequent dynamic delegation of team roles and responsibilities

While personnel changes within a research team over the course of a 3 year project are to be expected, the relationship between a project team member and their role within the project is significant. When project team management positions change, issues arise with the management of research grants. The following examples show how a series of individual changes in project personnel from each project partner have a cumulative effect on research grant administration and project management.

- Research Grant Administration – the ePOC project twice experienced the process of replacing the grant’s Chief Investigator due to relocation to other academic institutions. This triggered a contractually obligated administrative response by the project team to the Federal funding organisation. The subsequent change in Chief Investigator also resulted in relocation of the administration of the ‘grant’ from its original Faculty within the University to another. In turn, this instigated change in IT support personnel and Faculty finance officers who supported the grant.

- During the time of greatest upheaval of the amalgamation of the two health services personnel employed as contractors within the newly merged authority become engaged with the project. This necessitated the project team bringing these people ‘up to speed’ and renewing requests for technical project sub-tasks previously submitted. An example of such a scenario was the design, building and integration of an online referral form, which the ePOC team intended to use as a feeder system for patient registration. This request was overseen by a previously uninvolved ePOC project team member from the new area health service.

3.1.2 The need to be cognoscente of institutional mindsets by the project team

- In a research grant there exists a fundamental principle; that research is by its nature inherently risky and the opportunity of technical failure should not be unexpected. A philosophical point of difference on this principle emerged between the area health IT staff, and clinicians, academics and industry partner on the project. For example, there were several attempts by the area health service’s IT staff to manage the project as they managed all other external IT contracts. This approach is inappropriate because it potentially stifles creativity in order to minimise risk. The management overhead eventually consumes R&D project resources which are not costed to the same level of project management as commercial IT contracts.

- A request for a retrospective business case conforming to the newly amalgamated area health authority requirements is an example of the need for project teams to be cognoscente of the evolving mindsets of collaborating partners. A request for a revised business case was received from contracted IT staff (as discussed in 3.1.1) and after the project had been in existence for more than 7 months. Nonetheless, the project team was obliged to comply with the
partner organisation’s request. Unexpected requests of this nature shows that each issue encountered by the project management team was not significant in itself. Rather, it was the cumulative effects of such issues impacting on the resources of the project that resulted in the project taking a reactive rather than strategic focus.

- While there are further examples to illustrate the need to be aware of the organizational mindsets of collaborative R&D partners in any project, the final example from the ePOC project is indicative of the dichotomy that emerges under certain circumstances; the necessity to build parts of a system isolated from the intended enterprise-wide diffusion setting. Legal and Ethical considerations of patient data are paramount in finding technologically innovative ways to transform traditional health records and practices to eHealth. Despite championing of the ePOC project by executive level clinical and management personnel within area health, situations occurred where a project request was delayed by IT staff due to the perceived risks of research project personnel being given access to systems, sub-systems or patient data regarded as being of a sensitive nature.

3.2 Realignment of Service-Level Project Client Setting

Subsequent realignment of the service-level client environment from Community Health to a centralised Hospital setting occurred shortly after the area health service reorganisation. For TACT, the ePOC client, this meant changes in coordination of the clinical unit and the re-evaluation of the process of implementation of information systems into the unit. For example, while TACT was structured organizationally under the umbrella of Community Health, the service was scheduled for an implementation of the Community Health Information Management Enterprise (CHIME) system. CHIME is a clinical information system that is designed to improve service delivery, outcome measures and productivity by improved capture and management of community health service client information. It is also intended to improve the mechanisms for reporting at the Local, Area, State and National levels by improving the quality of community health information available and the efficiency that it is produced [Ns07].

The implementation of this system is a key component of the State Government’s IM&T strategy and is required to provide the essential source data for the EMR from the service sector undergoing the highest level of growth and change in service mix [Ns07]. The CHIME product features functionality that allows for the capture and management of: Client intake details; Client and group client demographics; Client referral information; Clinical issues/diagnoses; Clinical assessments; Clinical management plans; Clinical notes; Service contacts; Appointments and diary management and Best-practice clinical models and pathways [Ns07].

3.2.1 Interoperability and changing data feeder systems

The initial development of an ePOC system for TACT occurred in tandem with the rollout of CHIME. The project team planned to utilize all relevant CHIME data/clinical modules. In particular, the patient demographics module was intended by the research
team to become the primary patient data feeder system for its information system platform. However, realignment of the service-level client environment meant that CHIME module rollout was reprioritised to other services. As TACT had access to data through several different existing hospital-based systems, CHIME was not seen as imperative. This resulted in a delay in developing feeder system integration and as a result a new approach to accessing patient data feeder systems was sought. This is significant considering that TACT systems are presently paper-based; involving faxed referrals and paper records of clinical notes for each episode of care. Changes in data feeder systems had a significant impact on the progress of the project.

A similar scenario presented itself in regard to backend systems integration. For example, the TACT online referral form was developed for general practitioners to refer patients to TACT. The form was redesigned and updated to encourage more GPs to refer patients to TACT using the Web. In turn, the electronic format of data could be diffused to relevant backend systems. Given that TACT considered form design to be cost-prohibitive, the referral form was designed by a project member using Cold Fusion to integrate seamlessly into the area health’s backend database systems. As IT staff within area health changed and with each staff member assuming more pressing tasks, additional pressures were placed on the project team.

3.3 Minimum data sets for Ambulatory Care

An important consideration in designing mobile-based information systems for Ambulatory Care is the capture of appropriate, and necessary, data. Throughout the ePOC project lifecycle no minimum data set for Ambulatory Care for the state of NSW was available for the project to draw on. As a result, the project team adopted a hybrid version of the data sets developed for HITH (Hospital in the Home) used in the State of Victoria and the list of ‘processes’ informally used by TACT to gather required data for patient treatment. Prior to the development of the Victorian HITH Minimum Data Set, data sets focused on either inpatient areas or community-based care. Individual data sets did not meet the requirements of CAPAC programs, as these programs cross care boundaries from the acute inpatient setting to the community [Ac07].

A minimum data set that borrowed heavily from the Victorian model was developed for the project in consultation with the TACT unit’s medical director. This was regarded as an intermediate step until an official minimum data set for Ambulatory Care in NSW was created. The issues surrounding sets of data, their classification and utilization is circumstantial to the evolving health environment as Health becomes eHealth. One area where this is exemplified is in the area of health data messaging.

3.4 Evolving health messaging standards and the global transformation from Health to eHealth

In recent times there have been attempts to evaluate and select competing International health data messaging and protocol standards. Connection of distributed eHealth systems requires support by generic middleware components, while interoperability is addressed by messaging. A Health Level 7 (HL7) [HI07] messaging gateway handles messaging
from a clinical trial server to the PDA. At the same time as HL7 has gained wide acceptance as the messaging standard for eHealth, SNOMED CT\(^1\) is being broadly adopted across the health sector as the terminology standard for clinical health care. Reconciling these two (apparently competing) standards is difficult but one possible solution is basing HL7 message models on SNOMED CT concepts and relationships. Further to this, SNOMED CT concepts corresponding to a set of clinical observations have been mapped to HL7 message models for use in the project, and as a proof-of-concept for how the two standards interoperate. The interoperability of the two covers new territory and therefore, an open research question [RE07].

One of the findings from Dolin, et al. [DM04] in Kaiser-Permanente’s Convergent Medical Terminology project is that a tighter coupling of SNOMED CT and HL7 would greatly enhance interoperability, mainly because different implementations of HL7 could use different code sets and coding schemes. We can begin to solve this problem by doing away with the HL7 tables and using SNOMED CT code subsets exclusively for all code-type fields. One of the challenges of the ePOC project has been to find the right mix of the standards to form the basis for a middleware layer that will incorporate and interoperate both the features of both HL7 and SNOMED CT. The study of the relative strengths and weakness of such large International standards involved a serious commitment of time and resources that were not factored into the project costing but are nonetheless important if the project outcomes are to have a broad research appeal.

3.5 End User Issues

3.5.1 Training

A field trial of the ePOC PDA system prototype was planned for May 2006. In the preceding weeks training was provided to TACT staff. As the TACT service works 2 x 8 hour shifts per day (including weekends), careful planning was required to accommodate all staff. The training involved informal, hands-on experience with the PDA so clinicians could become familiar with the newly designed data entry screens for entering clinical observations. Although TACT staff were introduced to the PDA over the course of the project, during focus groups and question & answer sessions, many had not had the opportunity to ‘play’ with the device and be tutored on its operation by the project team. Comprehensive training manuals were developed to guide staff through the steps involved in using the device and TACT staff were given access to 2 PDAs and the user manuals for a period of 2 weeks directly prior to the start of the field trial.

On day one of the field trial the project team member running the field trial arrived at the unit expecting to begin the trial with a pre-trained staff member. However, when the team member arrived at TACT he was confronted with a new TACT staff member who was unaware of the project. Additionally, the PDA devices given to the TACT service for training were not used at all during the 2 week training window before the trial began. This highlights the issue of differing levels of commitment and communication within collaborative R&D projects. It was assumed TACT staff were being provided

\(^{1}\) (SNOMED CT) Systematised Nomenclature of Medicine Clinical Terminology
with adequate information from TACT management on the ePOC steering committee.

4 Anticipating the Unforeseen - Mitigation Strategies

Modern collaborative R&D projects, exemplified by the ePOC Project - geographically dispersed University, Health & IT partners - are in effect a form of de-facto business ecosystems. McNurlin & Sprague indicate that the management of such relationships requires flexibility because relationships change more frequently. Further, they suggest co-evolution requires a different mindset from the command-and-control mindset of the past [MS06]. The ePOC project uses a combination of the formal and informal approach to information system strategy, consistent with the recommended approach for strategy formulation with the following characteristics: flexible, modular and incorporate deliverables from earlier or parallel activities; emphasis on deliverables; clear checkpoints; recognition of the interactive and cyclic nature of the process; recognition of the importance of the human side of the process and simple diagramming tools, as recommended by Ward and Peppard [WP02]. Adopting such an approach enables project teams to drive the development lifecycle in a proactive rather than reactive manner. For example, the ePOC project team carried out comprehensive data flow and process mapping of TACT workflows. Simple diagramming tools, such as CASE tools, Data Flow Diagrams and Visio, enabled revisions of the workflows to be carried out as they changed with new organizational structures, new personnel, roles & responsibilities and changing data feeder systems.

The project also saw a need to address the social aspects of each of Nicholas’ [Ni01] dimensions of uncertainty. According to Nicholas [Ni01] “uncertainty is measured roughly by the difficulty in predicting the final outcome in terms of the dimensions of time, cost and technical performance”. Nicholas further stresses that most projects experience uncertainty in one or two dimensions while the most complex projects have uncertainty in all three dimensions [Ni01]. The development of mitigation strategies are a means of proactively responding as unforeseen issues arise. As Dorner [Dd97] asserts, “expecting the unexpected is often better preparation for coping with risk than preparing extensive plans and believing that the unexpected has been eliminated”.

The ePOC project team utilize the method of implementing risk mitigation strategies to ultimately ensure maximum opportunity for project success. The two focus areas for the ePOC project team in this regard are, adopting an iterative, consultative approach to project management and end user engagement and incorporating a change champion philosophy.

4.1 A Consultative Approach

The ePOC project team experience mirrors that of the Pathways Home Project [CT06] in that the ePOC process of development has itself become an important and integral part of the project team engagement and interaction with the project participants. Similarly, extensive modelling of evolving stakeholder relationships and informational interactions experienced in the Pathways Home Project have for ePOC, became an ongoing activity
[CT06]. The project team believe the simplest way of addressing each characteristic described in Section 3 is through the adoption of an interactive, consultative approach to project management, consistent with that proposed by Ward and Peppard [WP02]. A combination of techniques was used to enhance the approach taken within the ePOC project. These techniques included creating a project Website, a dedicated ePOC project notice board which was displayed in TACT, frequent information update flyers, Q&A sessions, and Questionnaires and Focus Groups before and after each project milestone (such as a field trial).

This approach focuses on system development and user involvement throughout the project. Importantly, different levels of end-user experience should be considered. For example, ePOC project end users include clinicians, working in the field, as well as managers & administrators. The managerial structure of the unit of study must also be well understood, as a manager may pass onto staff a managerial perspective on the system rather than the perspective that is most suitable for workers at the ‘coalface’.

- Change Champions - To mitigate this issue a change champion should be appointed from project conception, ideally, not at managerial level. Rather, the champion should be drawn from the specific user group of the delivered system, particularly in situations where the system involves a paradigm shift; such as in the ePOC case, from paper-based to electronic.

However, as Singh et al [SB03] suggest, a shift from a technical to a users’ perspective is difficult to achieve. This is particularly true at the beginning of a project when the issues are complex and ambiguous. The ePOC project team’s experience is that adopting an iterative, consultative approach to project management similar to Dynamic Systems Development Methodology (DSDM) during project inception and sustained throughout the project lifecycle will assist in addressing these issues.

4.2 Applying Dynamic Systems Development Methodology to Project Management

Dynamic Systems Development Methodology is a framework supported by its continuous user involvement in an iterative development and incremental 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 number of agile methods for developing software and forms part of the Agile Alliance. DSDM was developed in the United Kingdom in the 1990s by a consortium of vendors and experts in the field of Information Systems development [WS06]. There are nine principles of DSDM and while all nine are noteworthy, the following five 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 ‘Products’ of the ePOC system may include a distinct functional unit or value added component, e.g., 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.

• **Reversible changes during development**
  - The ability to change a system component or project management technique proactively minimises project delays throughout the project lifecycle.

• **Integrated testing throughout the lifecycle**
  - Testing of new and modified/updated software modules.

• **Collaboration and co-operation between all stakeholders**
  - Operationalised by focusing on an iterative and consultative approach.

**5. Conclusion**

This paper has described the ePOC project and the issues that confronted the project management team throughout its lifecycle. Many of the issues described, such as restructures, changing personnel, evolving protocols and standards are not new. Project managers far and wide can provide anecdotal evidence of similar issues faced by project teams. However, unless these issues are openly discussed in research diffusion settings such as conferences and symposia then generations of IS project managers, developers and researchers are destined to deal with the consequences. This paper is intended as a cautionary tale for project managers, systems developers and researchers who may be about to embark on a similar journey irrespective of industry sector, highlighting a series of important issues impacting on project management and discussing mitigation strategies to address these issues. In the present tense the ePOC project has implemented its second phase, a working PDA-based point of care solution for the collection of clinical observations by the ambulatory care team. Field trials of the software, which models the clinical process in terms of HL7 v3 and SNOMED CT, are complete and the outcomes are being analysed. An important epilogue to this paper is a post-implementation evaluation of the ePOC software by the industry partners, both the area health and Pen Computer Systems, to determine the future for the project’s outcomes. The outcomes from that decision making, and the overall impact of the ePOC project will be reported in the presentation of this paper.

**Bibliography**

[Ac07]  


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