
Incorporating Content, Context and Process Evaluation into Action Design Research

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Abstract

This paper examines the integration of content, context and process (CCP), an human-centred approach to evaluation, into Action Design Research (ADR) to complement the latter's more prescribed technology-centred project and software audits of project progress. The examination is conducted through a case study in which successive ICT student teams are incrementally building, over several semesters, tailored, low cost business intelligence (BI) systems for an organisation in the not-for-profit (NFP) sector. The BI systems enhance performance monitoring and regulatory reporting for the NFP. The integration of CCP evaluation into ADR is showing unexpected outcomes.

1. Introduction

Action Design Research (ADR) is a contemporary socio-technical approach that draws on Action Research and Design Science by valuing both organisational relevance and technological rigour with the intention of developing design knowledge (Sein, Henfridsson, Purao, Rossi, and Lindgren 2011). ADR aims at building innovative artefacts in an organisational setting. This takes place through a predefined process to address a problem-solving situation while stakeholders learn from the intervention. Underlying ADR is a strong reliance on review through a relevance cycle of building, intervention and evaluation (BIE). However, evaluation processes within ADR require more specificity to be useful for stakeholders.

From a growing body of evaluation literature, Stockdale and Standing (2006) recognise the absence of an evaluation framework to reflect social, political and cultural factors that influence project development. They argue that many information systems (IS) evaluations overlook the social context in organisations by focussing on the technical problem. They propose an interpretive evaluation framework by adapting the content, context and process (CCP) model from Symons (1991). CCP aligned with technical audits offers a comprehensive appraisal of IS projects.

The value of holistic evaluations in ADR is illustrated in an ongoing research project in the not-for-profit sector. The intention of the project is to design a data warehouse and reporting tools in the cloud to capture, store and retrieve quality integrated data as first steps to a BI solution. The construction of operational BI artefacts takes place progressively in Connections ACT, a local Canberra not-for-profit organisation (NFP). The aim is to keep costs low and to utilise available resources - student teams, funding from grants, university technical expertise, community support, and open source software options. This project is ongoing, incremental, empirical, and heavily iterative with two to four student teams each semester allocated to the project until the planned implementation in late 2014. This empirical study serves as a means of deriving a conceptual guide useful to other NFPs wishing to implement BI in the Cloud.

This paper continues with a literature review positioning the paper within existing research and follows with an illustration of a socio-technical evaluation of the Connections ACT project. From this project, a CCP evaluation framework is integrated with ADR, extending the work of Sein et al. (2011). The discussion and concluding sections review the paper to comment on the integrated framework and areas for future research.

2. Literature Review

Action Design Research (ADR) aims to address a problem-based situation by building innovative technical artefacts in an organisational setting using a structured and predefined process and to learn from the intervention. Strong support for ADR has been offered by Sein et al. (2011) with the claim that ADR is a methodological solution which combines both Action Research (AR) with its enduring research tradition and Design Science Research (DSR) being an established research approach in the IS discipline. AR, in an iterative process, investigates a phenomenon through researcher intervention and focuses on theory generation with scant regard for the IT artefact. On the other hand, DSR positions IT artefacts at the core of the IS discipline yet fails to adequately recognise the role of organisational context shaping both the design and deployed artefact (Sein et al. 2011). Järvinen (2007) claims that AR and DSR can be used together in a study with relative ease. Meanwhile, Iivari and Venable (2009) critique the paradigmatic assumptions of AR and DSR by examining the ontology, epistemology, and methodology of each to conclude that ADR can reconcile divergent view but care needs to be taken due to fundamental philosophical differences.

The ADR approach proposed by Sein et al. (2011) builds on Cole, Purao, Rossi and Sein (2005) to prescribe four stages within which are seven principles, set out in Table 1:

Table 1. Action Design Research Stages and Principles (Sein et al. 2011)

| | |
|-----------------|--|
| Stage 1: | Problem Formulation |
| | Principle 1: Practice-Inspired Research |
| | Principle 2: Theory-Ingrained Artefact |
| Stage 2: | Building, Intervention and Evaluation |
| | Principle 3: Reciprocal Shaping |
| | Principle 4: Mutually Influential Roles |
| | Principle 5: Authentic and Concurrent Evaluation |
| Stage 3: | Reflection and Learning |
| | Principle 6: Guided Emergence |
| Stage 4: | Formalisation of learning |
| | Principle 7: Generalised Outcomes |

This paper focusses on Stage 2 in Table 1: Building, Intervention and Evaluation (BIE). Evaluation has long been a topic of discussion in the AR and DSR literature. It was noted by Sein et al (2011, p.39) that, in most DSR efforts, “awareness of the problem precedes the development of the artefact”, which is followed by evaluation. This is the ‘build and then evaluate’ cycle (Hevner, March, Park and Ram 2004; March and Smith 1995). Sein et al (2011, p.40) argue that ADR is a new research method which recognises that the artefact, framed by March and Smith (1995, 256) as “constructs, models, methods, and instantiations”, emerges from interaction with the organisational context. Figure 1 shows a typical BIE which suits ADR efforts that emphasise creating an innovative technological design at the outset (IT-dominant BIE) (Sein et al. 2011).

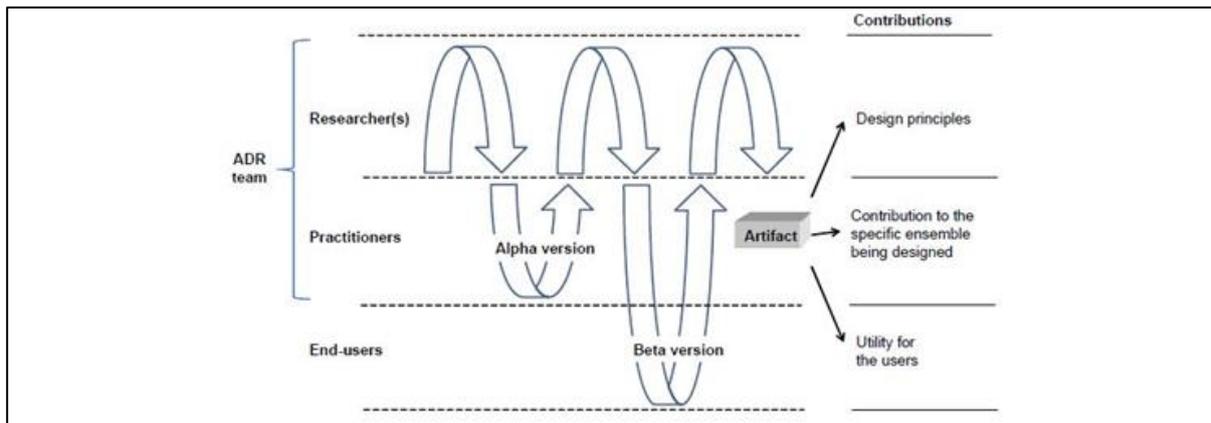


Figure 1: The Generic Schema for Building, Intervention and Evaluation BIE (Sein et al. 2011)

Sein et al. (2011) use an additional slightly modified diagram with deeper end-user participation at the alpha version to describe ADR efforts to generate design knowledge where the primary source of innovation is organisational intervention (organisation-dominant BIE).

Stage 2 (BIE) of the ADR approach draws on three principles: reciprocal shaping, mutually influential roles, and authentic and concurrent evaluation. Together, these principles emphasise the inseparability of the domains that influence the ADR project (Sein et al. 2011). Both BIE schemas by Sein et al. (2011) demonstrate an evaluation cycle for the alpha version of the artefact which is formative and another for the beta version which is summative. In prototyping situations or when project goals are indistinct, it is possible that more iterations are required, in which case, evaluation cycles are dependent on the version of the artefact. Sein et al. (2011) claim that controlled evaluations can be difficult to achieve in an ADR project due to the emergent nature of the artefact. In prescribing alpha and beta evaluations, Sein et al. (2011) specify evaluation timings but downplay the details of what, why, who and how of ADR evaluation.

Stockdale and Standing (2006) ascertain the preponderance of technical assessments in IS evaluations. They propose an interpretive approach to complement software evaluations. Stockdale and Standing (2006) refer to the what, why, who, when and how of IS evaluation in their paper extending Symon’s (1991) content, context and process (CCP) framework. The ‘what’ is represented by the *content* element to know which measures and metrics comprise the evaluation. This is compounded in information systems with less measurable societal and organisational impacts. The *context* concept requires the ‘why’ and ‘who’ to be considered, this being internal and external organisational influences and various stakeholders. The *process* construct takes into account the ‘when’ and ‘how’. Importantly, Symons (1991, p. 211) argues for evaluation to continue throughout the project lifecycle, thus reducing the risk of failure.

Likewise, Pries-Heje, Baskerville and Venable (2008) propose a strategic framework for DSR evaluation. They refer to the what, when and how of DSR evaluation, namely, product and process, ex ante and ex post, and artificial or naturalist settings, with lesser focus on the why and who. Pries-Heje et al. (2008) explain that DSR evaluation is often oriented towards ex

post timings while economic costs are paramount in ex ante analysis. This is certainly true in the private sector. In both public and not-for-profit sectors the profit motive is less, with the recognition that other factors are at play such as concern for social well-being.

Since ADR is a socio-technical methodology, it would be expected that evaluation covers both perspectives. MacKrell and McDonald (2014) contend that human- and technology-centred evaluations together produce richer and more complete knowledge than evaluations which focus separately on either social or technical dimensions. ADR offers a means of bridging the conceptual gap between dichotomies of social versus technical, and informal versus formal evaluations, overcoming concerns of livari and Venable (2007). This paper takes another look at ADR evaluation, to bring together the CCP framework and relevant concepts from DSR evaluation to propose an ADR evaluation strategy.

3. Case Study

A research approach for the study was sought which was prescriptive in the IT artefact development lifecycle (IT-dominant BIE) necessitating a technology-driven audit. The research approach also needed to be socially participative, reflective and reflexive (organisation-dominant BIE), requiring a qualitative evaluative method, such as that offered by CCP. These features guide the project's development.

3.1. Research Site

The project is a case study with Connections ACT Incorporated, a local Canberra community organisation committed to helping disadvantaged communities and families who are homeless (or at risk of becoming homeless). Connections ACT consists of 18 paid staff who assist over 3,000 people in the ACT annually through two services: First Point, the central intake service for the homeless, and CanFaCS, a service for homeless fathers and their children.

Information systems (IS) in Connections ACT consist of:

- Excel spreadsheets for managing the occupancy of properties for CanFaCS. Data related to nine properties and rental bookings are located in various non-structured repositories such as spreadsheets and whiteboards matrices.
- SQL database called SHIP (Specialist Homelessness Information Platform) with a Web-based interface built by a Melbourne-based external consultant for the collection of demographic homeless client data for First Point. It has limited standard and customized reporting features.
- SQL database called Daily Capacity Report (DCR) developed with Alpha 5 technology built for First Point by a Melbourne-based external consultant for tracking accommodation and outreach availability. The system is not supported and has limited reporting features.
- BitCloud is a commercial enterprise for hosting applications in the cloud at a financial cost to Connections ACT.

The managers at Connections ACT struggle with onerous compliance and ad hoc reporting since often client data capture is cumbersome, data quality is poor, information retrieval is haphazard, and software is inadequate. NFPs such as Connections ACT are increasingly reliant on accurate and quickly-retrievable organisational data for regulatory reporting and on-going funding. This is difficult to realise for most NFPs since the software available is predominantly suited to organisations in the for-profit sector which have different needs and resource-bases, and are not liable to compliance reporting as are NFPs (MacKrell 2012). By addressing Connections ACT's data and software challenges, this project will enable the

organisation to concentrate its limited resources on core business (helping the homeless), enabling it to excel better in this work.

3.2. Research Methodology

The project is described below within the four stages and seven principles of ADR proposed by Sein et al. (2011) and set out in Table 1. While the stages of ADR are portrayed neatly in sequence, in reality, with reliance on evaluation, reflection, reflexivity and intervention, the stages overlap and parallel during iterations.

3.2.1 Problem Formulation

In early 2012, the Executive Officer (EO) of Connections ACT contacted the lead researcher for assistance with the deteriorating DCR database. The initial fact-finding stage of the project took place in late 2012, utilising a human-centred 'sense-making' approach to identify the technical, organisational, informational and decisional needs of Connections ACT (MacKrell and McDonald 2014). The lead researcher conducted nine single face-to-face, in-depth interviews with senior Connections ACT managers and one board member, and three group meetings with University of Canberra BI and data warehouse experts. This provided background to the problem enabling basic requirements elicitation. Analysis of interview transcripts and organisational documents suggested that silos of data existed in the organisation due to non-linking databases and spreadsheets, in turn thwarting the extraction and use of the valuable information they contain. As an upshot of this phase, it was determined that a practical outcome of the project would be the design, development and deployment of stable and reliable data repositories and IS management systems as BI artefacts for both First Point and CanFaCS as the preliminary stage to BI.

As stated earlier, Sein et al. (2012) propose seven principles within the four stages. The two principles which apply in this (first) stage are Principle 1: Practice-Inspired Research and Principle 2: Theory-Ingained Artefact. The research activity is problem-inspired since the trigger for the project was a phone call from the Connections ACT EO who was receptive to practice-inspired research and welcomed a joint venture. The projected artefact is theory-embedded, informed in the initial stages through sense-making, and structured via tailored industry frames of reference including business process models and mapping.

3.2.2 Building Intervention and Evaluation (BIE)

Gregor and Hevner (2013, p.339), in their recent paper, use the term program to define a significant DSR research program which "typically encompasses many researchers over several years", while a project refers to a "portion of a larger program" which may be interim attempts at theorising. The researchers, in this paper, remain tentative about terminology but stay with the terms project and mini-project because of the project's strong practical purpose.

The entire project is a complex long-term undertaking, broken into mini-projects, to build a BI solution for a NFP, Connections ACT. The BI deliverables consist of numerous data, software and process artefacts, which will be described in detail in a future paper. The project is part of a work-integrated learning (WIL) subject offered as a capstone to students in their final semester of studies. Each student team is provided with a proposal of essential and desirable deliverables as a distinct mini-project expected by the end of semester. Student teams, usually comprising a project leader, analyst, developer and tester, build the artefacts. The teams are well supported with appropriate scaffolding and mentoring each semester by the subject convenor, tutor, project coordinator, university and community technical experts, and importantly, the client. Teams are expected to fulfil documentation requirements, complete a comprehensive testing schedule, and deliver to the client a functioning artefact, all of which is assessed and graded. These assessments are formal, with a concentration on technical and tangible aspects of system design and development.

The social dimension is called into play through less formal qualitative evaluations of student teams and client users and managers. These interviews/meetings are face-to-face, semi-structured, single or team conducted at several points in the semester: at the start and end of each semester, and mid-semester and/or any crises point. While these interviews/meetings are comparatively informal, they are guided by a prepared interview script or meeting agenda.

The principles of Sein et al. (2011) which apply at this stage are Principle 3: Reciprocal Shaping, Principle 4: Mutually Influential Roles, and Principle 5: Authentic and Concurrent Evaluation. Reciprocal shaping is described as the iterative process to construct and reconstruct both the IT artefact and organisational context when solving 'wicked problems'. One of the so-called 'wicked problems' is Excel spreadsheets, created by the client as a stop-gap 'feral' measure in lieu of a structured data repository (Houghton and MacKrell 2014). An illustration of mutually influential roles takes place when project participants learn from each other. As student teams progressively develop a database to replace Excel spreadsheets, the client managers steadily become aware of technical and business potentials from storage, analysis and retrieval of data. This realisation leads to greater commitment to the project by the clients and the prospect of solution intervention by the researchers. A senior manager stated in an interview, "Yeah. Look, I suppose the key takeaway for you today is that certainly I'm still quite strongly committed to this project. We've both invested an awful lot in it, as have the students, and we're quite conscious of the need to adapt and be creative and look for better, more productive ways of doing things".

Regarding authentic and concurrent evaluation, it has already been identified that evaluation is a key characteristic of this project with evaluation cycles dependent on more than routine ex ante and ex post alpha and beta versions, with artefact development complicated by discrete building phases associated with varying teams.

3.2.3 Reflection and Learning

The principle which applies at this stage is Principle 6: Guided Emergence, referring to the interplay between guidance through design, and emergence through evaluation. The learning stage relies on evaluation, both human- and technology-centred to encourage reflection and ensure more useful project outcomes. McKay, Marshall and Heath (2010) argue that technology-centred concepts of design science have been too limiting, and that human-centred design science should be built-in. The project involves many stakeholders: students, teaching staff, technical experts (university and community), clients, project coordinators, and researchers. All of the actors have a story to tell, not least of all the students as part of their capstone learning experience. Mutual learning takes place which is multi-faceted: being technical, social, organizational and educational.

While debate continues regarding the role of theory and theorising in design science research (Cole et al. 2005; Venable 2006), these authors contend that ADR has a role to formulate and utilise theories to embody statements of knowledge for its creative practical activities. This argument is consistent with Gregor's theory for design and action which says 'how to do something' (Venable 2006, p.628). Theoretic topics such as IS evaluation (Fidock, Carroll and Rynne 2010; Serafeimidis and Smithson 2003) and IS design (Markus, Majchrzak and Gasser 2002) are embedded in ADR methodology. The study touches on technical design topics such as the open source software options to build IT artefacts allowing NFPs to enter the BI and data warehouse arena at reasonable cost, applicable to their needs (Klawans 2006).

3.2.4 Formalisation of Learning

The study is a combined venture of Connections ACT and the University of Canberra. The situated practice-based learning of both design principles and workplace change will be generalised as a conceptual framework extendable to the not-for-profit sector. The intent at

this juncture is to disseminate new knowledge to share through publishing papers, conducting workshops, and instigating organisational change. This activity complies with Principle 7: Generalised Outcomes, discussed further in the concluding section of this paper.

4. Formulating a Generic Socio-Technical Evaluation Framework

In this section, both social appraisals as the CCP approach, and technical audits as traditional project milestones are discussed in terms of the project. Because of the nature of the project, the timing of evaluations is recurrent and iterative, not limited to ex ante and post ante for alpha and beta versions (Pries-Heje et al. 2008; Sein et al. 2011). Pries-Heje et al. (2008) drawing on Venable (2006) refer to artificial and natural setting. By definition, this is a work-integrated learning (WIL) project. WIL is an umbrella term for learning activities such as activity-based learning, work-based learning and co-operative education, with attempts to link learning in academic and practice settings. WIL is not easily defined because it covers a diverse range of activities from internships and placements to real client projects and other practical, contextualised tasks (Fitch 2011). While much software testing takes place in an artificial setting, such as the university, the client is a real organisation. As well, the opinions of stakeholders emerge as highly significant for shaping both product (BI artefact) and development processes, thus increasing the chances of project realisation. For this project, technical success was broadly defined in terms of releasing to the client functioning and useful software without too many disruptions. Social outcomes for the project were never clearly articulated but emerged as the study took form.

4.1. Social Appraisals: Content, Context and Process

In their paper, Stockdale and Standing (2006) extend Symon's (1991) content, context and process (CCP) framework from an organisational setting to information systems (IS). These are the social aspects of appraisals when the organisational, political and cultural factors that influence project development are accounted for, that is, the what, why, who, when and how of IS evaluation. As explained by Stockdale and Standing (2006), the 'what' in the project lifecycle is represented by the content construct to know what is being measured and which metrics comprise the evaluation. This is compounded in information systems with less measurable societal and organisational impacts. The element of context requires the 'why' and 'who' to be considered, this being internal and external organisational influences and various stakeholders. The process construct takes into account the 'when' and 'how'. Importantly, Symons (1991, p. 211) argues for evaluation to continue throughout the project lifecycle, thus reducing the risk of failure. CCP applications to the case are discussed below. Although CCP constructs are categorised separately, in reality they are intertwined and difficult to pull apart for analysis.

4.1.1 Content (what is evaluated)

The 'what' is both the BI artefact and the processes employed to construct the artefact within the organisational settings of university and client, and the means by which assessments are performed. As explained, measurements are not used for qualitative appraisals. Rather, assessments are in the form of interviews conducted by the researchers at regular intervals during the project lifecycle. These interviews are recorded, analysed and interpreted according to the researchers' frame of reference, and triangulated through student interviews and the reflective log written by the lead researcher.

Before the start of every semester, the researchers meet with the client, a meeting usually attended by four senior managers - one manager from First Point, one manager from

CanFaCS, and both the Executive Officer and Business Manager from the parent organisation Connections ACT - to deliberate over the following:

- Status of the project. What progress was made over the last semester ? What progress is expected over the coming semester ?
- Team-level deliverables. Is the scope of the mini-project achievable for each team ? Have the teams produced the deliverables ?

Once the project had been ongoing for two semesters, the managers were gaining confidence in their abilities to comment on the progress of the project. This was welcomed by the researchers. As the Business manager stated on behalf of the other managers:

Even if we don't quite achieve the big vision this semester, it's still a good step on the way I think. I guess there are a couple of things that I'm really looking for an outcome on. That is a better sense of coordination around what the teams are doing, and the second thing is around being clear about what they're actually working on and what they're capable of delivering by the end of this semester.

Regular meetings with the client are invaluable with decisions made in a participative manner, this being the modus operandi of many NFPs (MacKrell and Van Den Boogaard 2012). For example, consensus was reached amicably at the meeting held prior to the incoming semester, when the Business Manager confided:

Well, at the start of the meeting, I probably would have been hesitant to say yes we'll go with three [mini-projects] but the data warehousing one seems to - it will probably require minimal amount of input and engagement from us. So happy to see what the view of others [managers] is on that score. But it seems like it's viable to go with three [mini-projects].

The information gathered at these meetings is triangulated through consultations with student teams. Every semester, new student teams are set up by the subject convenor. The researchers have little control over the composition of the student teams, therefore, previous experience, knowledge and skills of team members are not known. Meetings with student teams take place a week or two after they are allocated to teams and are assigned their project with the prepared proposals. During the semester, the number of meetings with student teams is directly proportional to the amount of difficulty they are experiencing. That is, the more difficulty, the more meetings with both the researchers and the university technical experts who are mentoring the students. All teams are interviewed for a closure meeting after their final presentation and exam. With their final presentations and exams behind them, students tend to be more honest, contemplative and critical in their assessments. For instance, one student commented: "I think it was a good experience. Definitely in terms of stakeholder management and stuff like that. If it was smooth sailing, we probably wouldn't have learned anything ...".

Another form of qualitative socially-derived evaluation is the research log documented regularly and reliably by the lead researcher. This log is invaluable for verifying names of stakeholders, dates of activities, decisions made at meetings, and so on. Together with technical assessments related to software and project progress, as discussed in the section on technical audits below, they form a holistic appraisal of project content.

4.1.2 Context (who is evaluated, and why)

Stockdale and Standing (2006) refer to internal and external influences on a project. Dealing first with internal influences of the project, the influence of stakeholders, as the 'who', was strong and often conflicting. A dilemma for students was the prioritising of client and academic demands. Whom do the students please? One student agonised when waiting for the client to respond to a query "so we have two sides to consider, client and university. If we wait for the client and try and reach a solution, we might fail university ... We are learning to use pressure to advantage". The situation emulates complex workplace realities.

There is a tendency to forget that incoming teams are also stakeholders. Handing over to a new team is facilitated by comprehensive documentation and the latest source code from the previous team. Additionally, the EO of Connections ACT has recognised the hurdles of transference and briefs the teams at an induction session early in the semester, soon after new teams have formed. This has proven to be very effective, especially in reducing lag time as new teams settle in and familiarise themselves with the organisation and the technical complexities such as BitCloud.

Regarding external influences, an important stakeholder is the ACT Government. Strategic proposals by the directorate (ACT Government) to extend First Point central intake service for the homeless to other vulnerable citizens such as those with disabilities is 'in the pipeline', implying potential for growth. The Business Manager elucidated:

... we are still in a wait and see kind of environment for policy direction around housing and homelessness from the new government. But also because we're currently participating in an initiative by the ACT Government to look at building one human services gateway here in the ACT ... so we manage the system that - the central intake system for homelessness but there are also gateways for disabilities, for child youth and family support.

This was confirmed by the Executive Officer of Connections ACT, as such:

Okay. Just in a nutshell my understanding is that the ACT Government is looking at better integrating services but looking at a central intake model for human services more broadly... the DCR is virtually the only successful [software] tool in town that gets notifications of vacancies and places people into them. We do that in homelessness but clearly that could be in ... other sorts of human service deliverables. So its applicability to the very core business of what human services is ... is becoming more and more valuable.

The context in which the project is being developed is the 'why' influence. The client is operating in a turbulent environment, dependent on funders for survival; hence, the reference to the DCR as a successful tool is pertinent as Connections ACT managers consider commercialisation of their software in a strategy towards social enterprise, an effort to decrease dependency on tenuous grant funding.

4.1.3 Process (when and how evaluation occurs)

Pries-Heje et al (2008) classify evaluation settings as either artificial or naturalistic. Artificial evaluations occur in a contrived, non-realistic manner, such as simulations and software testing. Natural evaluations explore performance to solve real problems in a real environment such as an organisation. The students tested their software artefacts in both settings, at the university and at the client's premises to demonstrate functionality and achieve client acceptance sign-off.

During the lifetime of the project, there are as many iterations of development as there are semesters. The researchers determined it was essential to conduct evaluative interviews at important intervals. These evaluations are pre-semester and normative (ex ante), and post semester and summative (ex post). Processes to be adopted during the semester are discussed at the pre-semester meeting with the client managers. Further meetings with the client take place at the end of semester, and at any critical points during the semester. Occasionally, this has resulted in some very frank discussions, as evident in the dialogue below, from the Business Manager.

That with the benefit of hindsight it was probably a bit too ambitious, that it probably could have done with a greater sense of coordination, certainly early in the semester. Probably the handover from the semester one student teams wasn't done as effectively as it could have been done. There were some issues around the process and our availability and connections when the students needed to talk to us.

Process evaluations are fundamental for shaping the products and processes of the project. It is inevitable that all stakeholders, researchers, developers and clients, err occasionally. Adjustments need to be made reflexively. This has the effect of building a more robust community of practice for the discussion of issues. The Business Manager, speaking on behalf of the other managers, said:

Yeah, look. I suppose the key takeaway for you today is the certainly I'm still quite strongly committed to this project. We've both invested an awful lot in it, as have the students, and we're quite conscious of the need to adapt and be creative and look for better, more productive ways of doing things. All of this work fits within the broader scheme of things for us. We need to adapt and change or there won't be a Connections ACT in the future. So you know all the work that we're doing, not just this piece of work, but other things that we're doing around social enterprise initiatives, common ground, are looking for other sources of more diversified funding.

4.2. Technical Audits

Technical audits are not discussed in any depth in this paper, except to say they are vital to supplement the more qualitative social evaluations through CCP. Technical audits are standard for any project to demonstrate the worth of the artefact through criteria such as utility, quality, validity and efficacy (Gregor and Hevner 2013). Evidence is contained in specifications such as Project Charters, models of Entity-Relationship Diagrams (ERDs), Use Case Diagrams, testing schedules etc as well as controlled student team presentations and reports. Most of this documentation is developed and evaluated in an artificial environment prior to client acceptance testing in a naturalistic organisational setting.

5. Discussion

The project employs the ADR approach as laid out in Table 1. By integrating CCP social evaluations and technical audits into the ADR approach, the BIE generic schema described by Sein et al. (2011) in Figure 1 is no longer representative of a project developed as a non-commercial undertaking for a NFP. CCP-driven evaluations have contributed to producing the insights condensed below. The number in brackets following each dot point is linked to a corresponding annotation in Figure 2, an annotated version of Sein's BIE generic schema introduced in Figure 1.

Content (what is evaluated)

- Project vision/goals/contributions (high-level practical aim of the project is BI in the cloud in a NFP) are not so clear since working from a bottoms-up rather than top-down approach (3)
- Progress of mini-projects towards project goals is incremental and iterative, dependent on many variables such as knowledge, skills and abilities of the student teams, many of which are unknown (2)
- Development periods are iterative with discrete, short time periods of one semester (2)

Context (why and who is evaluated)

- Client manager (Influence and priorities of stakeholders) (1)
- Incoming student WIL team considered a stakeholder (1)
- Context of operation influences motivation of all stakeholders, for example, client is keen to develop a social enterprise culture for the NFP (1)

Process (when and how does evaluation occur)

- Handover delays (BitCloud, status of project, rebuild client – team relationships) (3)

- Induction session by client Executive Officer (3)
- Teams need regular contact with client (3)
- Client takes cautious approach, becoming aware of student teams limitations (3)
- Technical and social evaluations required. These improve the project's chances of success by shaping the project closer to the needs of stakeholders (4)

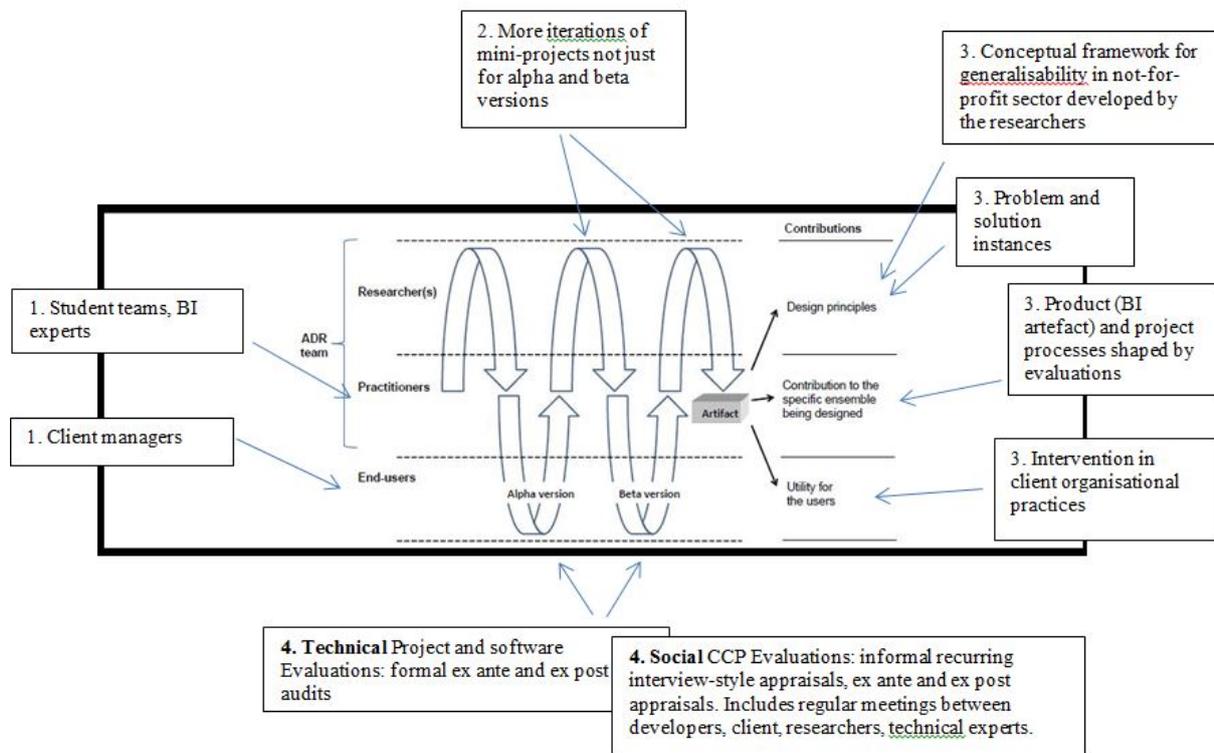


Figure 2: The ADR Generic Schema for Socio-Technical BIE incorporating CCP as it applies to the case study in the areas of 1. stakeholders, 2. iterations, 3. research outputs, and 4. evaluation (adapted from Sein et al. 2011).

In summary, socio-technical evaluations conducted within the ADR framework have revealed additional concepts, such as careful stakeholder management, to be included in a BIE generic schema as design guidelines for community projects. Socio-technical evaluations have contributed to shaping the project to suit the needs of all stakeholders: the client Connections ACT, WIL students, and the researchers. The Executive Officer communicated his gratification with the words "... a shared commitment, you're sticking with us, we're sticking with you. We're learning as we're going along."

Context for the use of CCP in ADR

Human activity is complex and case study research necessarily takes a particular stance. However, no stance is isolated. It resonates with other approaches and these are worth indicating.

Firstly, over the last decade there has been an evolution in thinking about Design Research and it now presents a complex picture. The ADR framework from Sein et al. (2011) was selected as the basis of this research, but is one of many that could have been chosen. One of the reasons for its selection was its recognition of the process of development, not just products. In an era of agile development, the Sein framework may seem rather traditional yet the research reported here suggests that the agile development of artefacts (called 'ensemble components') independent of the involvement of all stakeholders, misses out on some significant benefits that can accrue along with systems development. In particular, this

research shows that stakeholder-engaged project development can have much wider impacts in terms of improved systems literacy within an organisation, and increased technological engagement, that changes attitudes from systems being seen as necessary evils to them being positive contributors to the organisation. This was unexpected as the systems being developed were 'back office systems' which are usually evaluated prosaically in terms of efficiency and effectiveness.

Secondly, there are other design trends that complement the findings of this paper, for example, Value Sensitive Design (Yoo, Hultgren, Palzkill Woelfer, Hendry and Friedman 2013) and User Experience Design (Adikari, McDonald and Campbell 2013). In parallel with Sein et al. (2011), these trends, in their own ways, shift the focus of ICT evaluation from the product's behaviour to its relationship with stakeholders. In future, a coalition of research approaches sharing a similar approach may yield greater benefits than single approaches alone.

Thirdly, research is often conceived as being for the researcher in their search for knowledge accumulation. However 'transformative research' (for example, that advocated by Malhotra, Melville, and Watson 2013) promotes the benefits possible for all stakeholders. In this case, while the researchers are producing results for the research community, the organisation is benefitting greatly (through facilities provision and shifts in attitude towards greater engagement with their own systems) as are the students (through authentic development experience). This project is having transformative affects and is showing emergent gains beyond the initial goals of stakeholders, especially educational and attitudinal benefits for all participants.

Lastly, the NFP sector's use of information systems as a domain of study is of interest from many different perspectives. Crump and Raja (2013) for example, report on findings taking a different technology approach, that of shared services. They are interested in evaluating organisational readiness to assess and adopt different kinds of ICT systems - an approach that would complement the research reported here.

6. Conclusion

This paper proposes holistic iterative stakeholder evaluations through integration of content, context and process (CCP) appraisals into Action Design Research (ADR) to complement more prescribed technology-driven project and software audits. This socio-technical method of evaluation meshes well with socio-technical artefact development such as business intelligence (BI) software. The CCP framework focusses on qualitative human-focussed evaluation and is useful in providing both descriptive or 'what' knowledge about natural phenomena as well as prescriptive or 'how' knowledge (Gregor and Hevner 2013) through design principles. Similarly, Sein et al. (2011) recognise that a case study using ADR is highly situated and discuss the issue of theorising from the specific and unique to the generic and abstract. From the outset, the project being analysed in this paper has dual purposes - to make a difference in the case study site, Connections ACT, and to use the experience to create a set of analytic, design, intervention and evaluation guidelines for general use in the not-for-profit sector. This paper is a step towards those dual purposes.

The DSR knowledge contribution framework proposed by Gregor and Hevner (2013) is useful when considering the project's contribution to knowledge. The quadrant which is most apt for the study is Exaptation: Known Solutions Extended to New Problems. Gregor and Hevner (2013, p.347) describe this as "... contributions where design knowledge that already exists in one field is extended or refined so that it can be used in some new application area". The ADR generic schema for BIE (Sein et al. 2011) illustrated in Figure 1 is prescriptive for projects in a commercial setting. This paper extends the model in Figure 2 into the NFP sector with multiple iterations for WIL student-built BI artefacts. This paper concentrates on progress evaluation for a continuing project. The paper does not articulate minutiae of

artefact design nor stakeholder goals, participation and artefact appropriation. These are the domains of other papers.

Sein et al. (2011, p.45) argue that “design principles capture the knowledge gained about the process of building solutions for a given domain, and encompass knowledge about creating other instances that belong to this class”. A number of design principles are emerging from the case study that apply generally. Some examples include the use of open source software and cloud warehousing, project development being facilitated by academic researchers with WIL students, and the importance of CCP for adding value to an ADR project through qualitative stakeholder appraisals.

7. References

- Adikari, S., McDonald, C. and Campbell, J. (2013) "Agile User Experience Design: A Design Science Enquiry" Proceedings of Proceedings of the 24th Australasian Conference on Information Systems (ACIS), RMIT Melbourne Vic.
- Cole, R., Purao, S., Rossi, M. and Sein, M. (2005). "Being Proactive: Where Action Research meets Design Research". Proceedings of the 26th International Conference on Information Systems (ICIS). Las Vegas USA.
- Crump, B. and Raja, P. (2013) "A Case for Non-Profit Organisations to engage in the use of Shared Computing Services". Electronic Journal of Information Systems Evaluation Vol. 16, No. 4, 270-277.
- Fidock, J., Carroll, J. and Rynne, A. (2010). "Evaluating Information Systems: an appropriation perspective", in D. Hart and S. Gregor (eds). Information Systems Foundation: The Role of Design Science, ANU ePress, Canberra ACT.
- Fitch, K. (2011). "Developing Professionals: student experiences of a real-client project". Higher Education Research & Development, Vol. 30, No. 4, 491-503.
- Gregor, S. and Hevner, A. (2013). "Positioning and Presenting Design Science Research for Maximum Impact", MIS Quarterly. Vol. 37, No. 2, 337-355.
- Hevner, A., March, S., Park, J. and Ram, S. (2004). "Design Science in Information Systems Research". MIS Quarterly. Vol. 28, No.1, 75-195.
- Houghton, L. and MacKrell, D. (2014). "Sensemaking as Feral Information Systems: Conceptual and Framework Development", in L. Houghton and D. Kerr (eds) Feral Information Systems, Idea Group Inc. Hershey PA USA.
- Iivari, J. and Venable, J. (2009). "Action research and design science research – Seemingly similar but decisively dissimilar". Proceedings of the 17th European Conference in Information Systems (ECIS). Verona Italy.
- Järvinen, P. (2007). "Action Research is Similar to Design Science". Quality & Quantity. Vol. 41, 37-54.
- Klawans, B. (2006). "Saving Time and Money - Why Open-Source BI Makes Sense". Business Intelligence Journal. Vol. 11, No. 4, 18-24.
- McKay, J. and Marshall, P. (2001). "The dual imperatives of action research". Information Technology and People. Vol. 14, No. 1, 46-59.
- McKay, J., Marshall, P. and Heath G. (2010). "An Exploration of the Concept of Design in Information Systems". in Hart & Gregor (eds). Information Systems Foundation: The Role of Design Science, ANU ePress, Canberra ACT.
- MacKrell, D. (2012). "Delivering Optimal Health Outcomes: Making Sense of a Business Intelligence Decision in a Not-for-Profit Organisation". Proceedings of the Pacific Asia Conference on Information Systems (PACIS). Ho Chi Minh City Vietnam.

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- Mackrell, D. and McDonald, C. (2014). "Action Design Research: a Case Study of Business Intelligence in Non-Profit Organizations". Proceedings of the SIGDSS IFIP WG 8.3 International Conference, University Pierre and Marie Curie (UPMC) Paris.
- Mackrell, D. and Van Den Boogaard, M. (2012). "Socio-Technical Framework for Improved Decision-making in Not-for-Profit Organisations". Proceedings of the 23rd Australasian Conference on Information Systems (ACIS). Deakin University, Geelong Vic.
- Malhotra, A., Melville, N. and Watson, R. (2013) "Spurring Impactful Research on Information Systems for Environmental Sustainability". MIS Quarterly, Vol. 37 No. 4, 1265-1274, December.
- March, S. and Smith, G. (1995). "Design and natural science research on information technology". Decision Support Systems. Vol. 15, No. 4, 251-266.
- Markus, M., Majchrzak, A. and Gasser, L. (2002). "A Design Theory for Systems That Support Emergent Knowledge Processes". MIS Quarterly. Vol. 26, No. 3, 179-212.
- Pries-Heje, J., Baskerville, R. and Venable, J. (2008). "Strategies for Design Science research Evaluation", Proceedings of the European Conference on Information Systems (ECIS), Galway, Ireland.
- Sein, M., Henfridsson, O., Purao, S., Rossi, M. and Lindgren, R. (2011). "Action design research", MIS Quarterly. Vol. 35, No. 1, 35-56.
- Serafeimidis, V. and Smithson, S. (2003). "Information Systems Evaluation as an Organisational Institution – experience from a case study". Information Systems Journal. Vol. 13, 251-274.
- Stockdale, R. and Standing, C. (2006). "An interpretive approach to evaluating information systems: A content, context, process framework". European Journal of Operational Research. Vol. 173, 1090-1102.
- Symons, H. (1991). "A review of IS systems evaluation: content, context and process". European Journal of Information Systems (EJIS). Vol. 1, No. 3, 205-212.
- Venable, J. (2006). "The Role of Theory and Theorising in Design Science Research". First International Conference on Design Science (DESRIST). Claremont CA.
- Weick, K. (1995). Sense-making in Organizations. Sage Publications, Thousand Oaks CA.
- Yoo, D., Hultgren, A., Palzkill Woelfer, J., Hendry, D. and Friedman, B. (2013) "A value sensitive action-reflection model: evolving a co-design space with stakeholder and designer prompts". CHI '13: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 419-428.