Selecting a Suitable Methodology for Designing Innovative Solutions to Support Capability Improvement in a Complex Organisational Context as part of an Industry-Academic Collaboration

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ABSTRACT

This paper describes the process of investigating a number of different research methodologies in order to select a suitable approach for an effective Industry-Academic collaborative research project. The research project in question is a 15-month research partnership between a global financial organisation and a research team from a university institute. The aim is to collaboratively design innovative solutions to support the company's programme to improve their Information Technology (IT) capabilities using the IT Capability Maturity Framework (IT-CMF).

A number of potential approaches were investigated, including Action Research (AR), Canonical Action Research (AR), Design Science Research (DSR), Design Thinking/User Experience (UX) and Action Design Research (ADR). Having discussed these approaches, this paper then explains why ADR was chosen as the approach for this project and examines its validity in practice throughout the first half of the project.

The key contribution of this paper is a critical discussion of a decision-making process around methodology selection in a current Industry-Academic research project that aims to produce innovative solutions based on an organisational intervention. This problem is relevant to any discipline that engages in Industry-Academic collaboration, particularly with regard to socio-technical problems, including, for example, Information Systems (IS), Management and Organisation Studies.

Key words: Action Design Research; Design Science; Action Research; Canonical Action Research; Design Thinking; User Experience; Industry-Academic Collaboration; Capability Improvement; Organisational Change; Research Methodologies; Design Methodologies

INTRODUCTION

This paper describes the process of investigating a number of different research methodologies in order to select a suitable approach for an effective Industry-Academic collaborative research project. The key contribution of this paper is a critical discussion of a decision-making process around methodology selection in a current Industry-Academic research project that aims to develop innovative artefacts. Action Research (AR), Canonical Action Research (CAR), Design Science (DS), Design Thinking/User Experience (UX) and Action Design Research (ADR) are discussed. This paper then explains why ADR was chosen as the approach for this project and traces its efficacy in practice throughout the first nine months of the project. This problem is relevant to any discipline that engages in Industry-Academic collaboration, particularly with the aim of developing innovative socio-technical or ensemble artefacts, including, for example, Information Systems (IS), Management and Organisation Studies.

The need for the project arose from a problem identified in practice by the partner organisation. The organisation had been using the IT Capability Maturity Framework (IT-CMF) to assess the maturity of their Information Technology (IT) capabilities. Capabilities are an organisation's ability expressed in terms of its resources. As such, they are complex constructs, manifesting at the enterprise level but comprising resource and organising level skills, knowledge, behaviours, structures, processes and roles (Peppard & Ward 2004). Over the course of two years, the organisation had established a number of structures and processes to support their improvement efforts. As a result, a number of key capabilities, measured by IT-CMF assessments, had shown improvements across a diverse span of management capabilities. However, the extent and pace of improvements had fallen short of expectations.

This project was established in order to investigate more deeply the nature of capability improvement, its barriers and enablers, and to use existing practitioner and scholarly knowledge to design new artefacts to support the partner organisation in improving their IT capabilities, using IT-CMF. Peppard (2001) states that IT capabilities are specific to each

organisation and path dependent. Furthermore, they exist "in a complex web of social interactions, and may even depend critically on particular individuals" (267). Improving capabilities, particularly in large, global organisations, therefore represents a complex process involving a diverse set of social and technical factors, and the interactions between them.

This paper outlines the process of selecting a suitable methodology for this project. Both the nature of the project and the research problem outlined above raise a number of specific challenges that must be taken into consideration when selecting a suitable methodology. Notably, there is an imperative to generate both practical and theoretical outcomes. Practically, the resulting artefact should be relevant to the specific organisation but also suitable for use by any organisation wishing to implement capability improvement. Simultaneously, the research should be sufficiently novel from a theoretical perspective to allow researchers to contribute to the body of academic knowledge.

Research collaborations between industry and academia must navigate a large and diverse set of stakeholders, each with different perspectives and expectations. Some of the unique challenges that must be faced include the need to establish trust, negotiate cultural differences between key stakeholders, interweave complementary expertise throughout the research project, and effective communication (Barnes, Pashby, & Gibbons, 2002).

The specifics of this research project add another layer of complexity when selecting a suitable methodology. The research problem is a complex social and technical one, sometimes referred to as a 'wicked' problem (Rittel & Webber, 1973). Developing effective solutions therefore involves gaining an initial in-depth understanding of the complex problem, which includes the organisational culture, its infrastructure, and people's individual perspectives and work practices. This should be followed by ongoing interaction with participants through the conceptualisation and design phases.

Action Design Research, particularly its emphasis on the principle of *Guided Emergence*, partially supported the integration of the exploratory techniques of Action Research with the development emphasis of Design Science. However, we found that in terms of emphasising the importance of qualitative research at the problem formulation stage it did not go far enough. We therefore propose developing an enhanced model, rooted in an interpretivist

paradigm, which uses qualitative research techniques to fully understand the complex problem context before starting the process of defining solutions.

Literature Review – Problem Context

Before outlining how we selected the methodology, it is useful to outline the problem context from a theoretical perspective, which influenced the decision-making process. As the initial impetus for this research project came from a problem identified in practice, it was necessary to situate it in a broader theoretical context in order to identify the research opportunity. Therefore, an overarching research question was defined for the project. The question is:

How can capability most effectively be improved in complex global organisations?

This question concerns the transitioning of organisational capability, which encompasses the social and technical elements articulated above, to a desired future state. This situated our problem in the field of Organisational Change.

Kurt Lewin (1947) is one of the earliest proponents of change in social contexts. Lewin articulated a planned approach to change, comprising of a number of elements including Field Theory, Group Dynamics, Action Research and the 3-Step Model (Burnes, 2004).

Through his early articulations of Field Theory and Group Dynamics, Lewin (1947; 1951) emphasises the importance of the social context and conformity in shaping human behaviour and therefore its centrality to organisational change efforts. Action Research is proposed as the process to achieve change, recognising that change requires action and that success is based on an initial correct analysis of the situation (Kurt Lewin, 1946). Lewin (1951) proposes a 3-step model of change. The first step recognises that, in order to facilitate change, an organisation needs to break from the status quo and the traditional way of doing things; to 'Unfreeze'. Next, an iterative cycle of research and action is enacted to implement change in an unstable social context; the activity of Action Research. In the third and final stage, the change is embedded and becomes institutionalised; 'Refreeze'.

Armenakis and Harris (2009) have developed a detailed model of how change is institutionalised, which owes a clear debt to Lewin's earlier work, as is detailed in the 'Institutionalising Change Model' below. They advocate Action Research to involve "change recipients" in "the diagnosis, interpretation, and remediation of challenges facing the

organization" (130). Following Lewin's concept of 'Unfreezing', they adopt the term "change readiness" to reflect a positive approach to change, which contrasted with much contemporary work on change which was focused on employee resistance (132). The model highlights the centrality of both change agent and change participant roles. The attributes and credibility of the change agents, they stress, is a key influencer in successful change programmes (135).

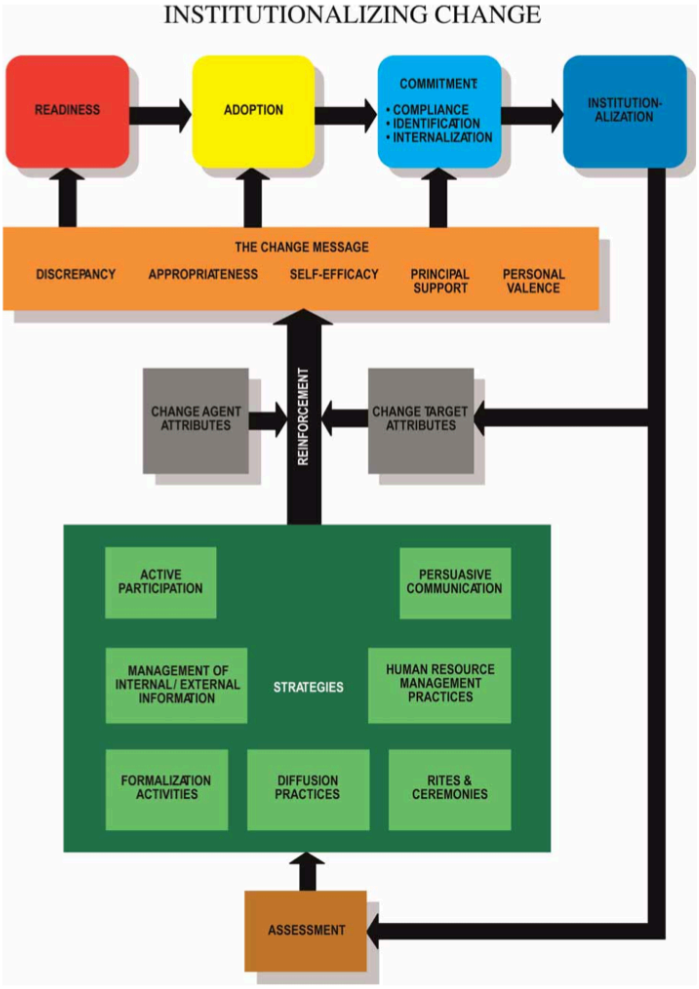

Figure 1: Armenakis & Harris (2009): The Institutionalising Change Model

The model above also highlights "strategies" that underpin a change programme and influence buy-in (Armenakis & Harris, 2009: 134). These include: "Active Participation", which means including recipients in the decision-making processes as detailed above; and "Persuasive Communication", which "may not be as effective as active participation" but can be executed in less time (135). Other key strategies include: "Information Management"; "Human Resource Practices" to support the change activity (e.g. compensation, performance appraisal, training and development programs); "Formalization Activities" such as putting in

place structures and procedures to support change activities; " Diffusion Practices", such as communities of practice and best practice programmes); and finally, supporting "Rites and Ceremonies". Finally, Armenakis and Harris (2009) also highlight the importance of internal context that might influence the success of a change programme.

Both Lewin's planned approach to change and the 'Institutionalising Change Model' reflect our initial conception of change as a complex activity, comprising of heterogeneous social and technical elements. These models put a strong emphasis on the people, as individuals and as part of a group, and their support for and belief in the change programme, as an enabler of success. The selected methodology should support the investigation of the problem based on the theories and models articulated here.

SELECTING THE METHODOLOGY

Having developed a deeper understanding of the initial problem, both as articulated by the organisation and as described in the literature, we can begin to examine a number of different methodologies to determine their suitability for this project. The methodology should support gaining an in-depth understanding of the problem context, both from an empirical and theoretical perspective. As articulated above, the problem context for this project is a complex social and technical one, which can best be understood by immersion within the organisation using techniques such as observation, interviews and other qualitative research methods.

The methodology should also support the design, development and evaluation of artefacts. In our case, the artefact is not required to be highly innovative in a technical sense. Instead, the artefact should be innovative from a social perspective, allowing practitioners to impact the improvement of their IT capability through its use. Therefore, it is necessary to include potential users and change agents, beyond the study team, in the conceptualisation, design and evaluation of the artefact.

There is also a need to ensure that appropriate attention is given, both to the immediacy of the organisational-driven, practical imperative to develop solutions, and to the methodical reflection and learning required for theoretical innovation. Finally, the methodology should support the potentially fraught processes of navigation and negotiation needed to ensure that

the project takes in to account and interweaves various stakeholder expectations, assumptions and expertise.

Research Needs
Practical and theoretical outcomes
Social & qualitative research
Reflection and learning
Human-centred artefact design, development and evaluation
Stakeholder negotiation

Table 1: Table indicating research needs for the project

The research team selected a number of approaches to examine in more detail; these are Action Research (AR), Canonical Action Research (AR), Design Science Research (DSR), Design Thinking/User Experience (UX) and Action Design Research (ADR). The following sections describe that work, discussing also the progression through the decision-making process.

Action Research

Kurt Lewin (1946) devised Action Research as a way to enact change through cooperation between practitioners and social scientists. The objective of an Action Research project is social action and change (Lewin 1946), or, as elaborated by Davison et al. (2004), "solving organisational problems through intervention while at the same time contributing to knowledge" (65). In the context of Action Research, an "intervention" is an action taken within the organisation, rather than introducing a technical object or artefact. The process of Action Research involves "a spiral of steps, each of which is composed of a circle of planning, action and fact-finding about the result of the action" (Lewin 1946: 38).

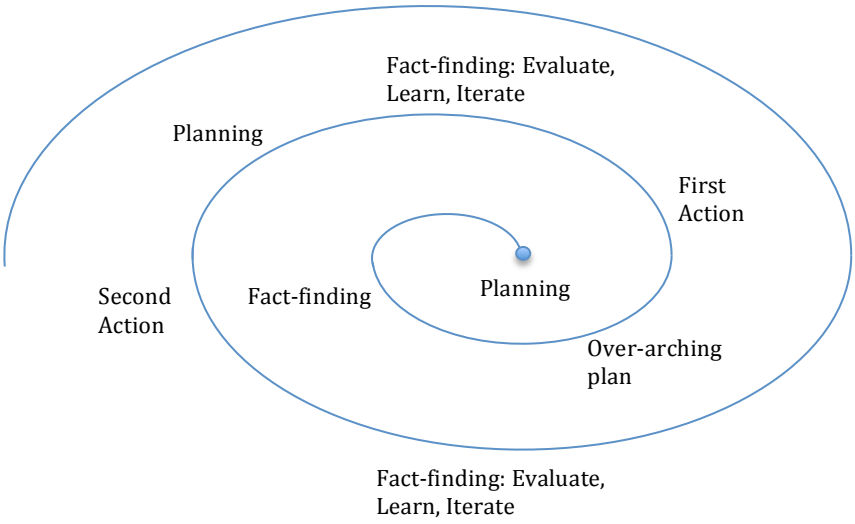

Figure 2: Visual depiction derived from Lewin's Action Research Process (1946)

According to Lewin's (1946) process, planning starts with a general idea, which must be examined carefully. Frequently, this will require "realistic fact-finding", which should take the form of "social research" (35). Once completed successfully, this will result in two outcomes: an overarching plan and a decision as to what the first action is to be. Lewin (1946) emphasises that this process will usually result in a modification of the original idea. In this way, Lewin's early model is clearly an iterative one, with an emphasis on emergent knowledge, learning and refining.

Canonical Action Research (CAR)

More recently, Davison at al. (2004) have sought to address "a paucity of methodological guidance" for those conducting and evaluating AR studies (65). They propose a methodology for Canonical Action Research (CAR), which consists of five principles and a five-stage process. 'Canonical' refers to a social science process-oriented model developed by Susman and Evered in 1978, rooted in qualitative, case and interpretive research, which is iterative, rigorous and collaborative (Davison et al. 2004).

CAR extends AR by putting in place "a set of interdependent principles and associated criteria" in order to address concern about AR's lack of methodological rigour (Davison et al., 2004: 66). CAR claims to be unique among other AR techniques by being "iterative, rigorous and collaborative, involving a focus on both organisational development and the generation of knowledge" (Davison et al., 2004: 66). Although they declare the process "iterative", it nonetheless should follow a "unidirectional flow" (72). Any iteration or deviation from this flow, they contest, should be justified and mentioned explicitly (Davison

et al. 2004). While time should be taken to "to plan, execute, observe and reflect upon actions" (68), this takes place at the end of the cycle, as is depicted in Figure 3 below.

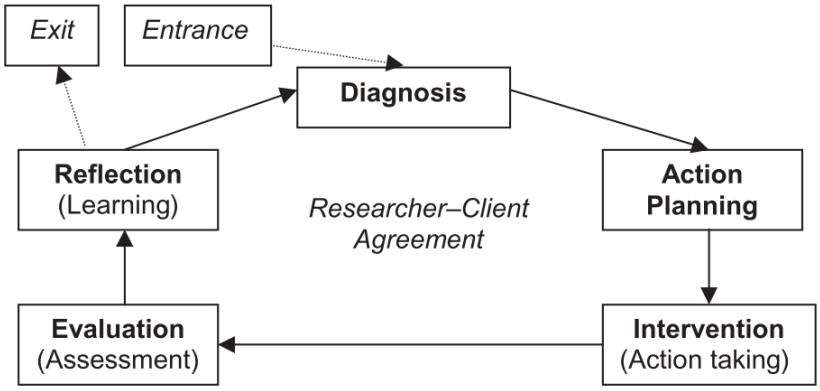

Figure 3: CAR Process Model (Davison et al., 2004)

CAR expressly identifies the importance of building trust among stakeholders. As such the first principle of CAR is the Researcher-Client Agreement (RCA) (Davison et al. 2004).

Design Science

Design Science is an approach that "creates and evaluates IT artefacts intended to solve organizational problems" (Hevner et al. 2004: 77). Design Science is one of the two sides of a larger "Information Systems Research Framework". It has its roots in Engineering and 'The Science of the Artificial' and is focused on building an IT artefact (Hevner et al., 2004). The other side of the cycle is "behavioural science", which seeks to "develop and justify theories (i.e. principles and laws) that explain or predict organizational and human phenomena" (Hevner et al. 2004: 76). Although Hevner et al. (2004) contest that these disciplines represent distinct paradigms (76), they both nonetheless stem from a natural science paradigm. This contrasts with the perspectives of AR and CAR, which take a social perspective. One of the ways in which this manifests is in how the respective approaches conceptualise the social aspects of the research project, both on an organisational and individual level. Design Science emphasises the application of explanatory and predictive models to the problem situation. This contrasts with the focus in AR and CAR, which emphasise using interpretive methods, such as social and qualitative research, to gain an in-depth understanding of the specific problem context and then adapt the research to this emergent understanding.

The Design Science process involves an iterative develop/build and justify/evaluate cycle (Hevner et al., 2004). Through the development and justification phases, behavioural science theories that "explain or predict phenomena" are applied to the identified business need to account for the organisational context (Hevner et al. 2004: 79). Design Science then builds and evaluates artefacts to meet that business need. Notably, the justify/evaluate phases occur after the develop/build phases, although there is an iterative cycle of assessment and refinement described. It is only after this cycle is complete that the resulting artefact is then 'applied' to the organisational context, see figure 4 below.

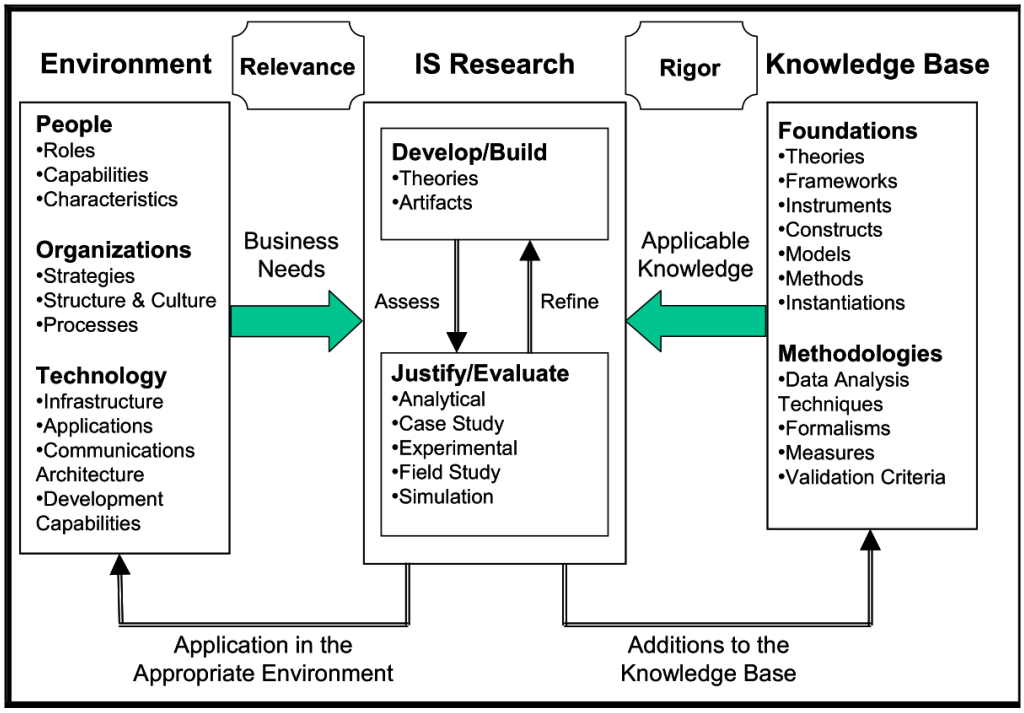

Figure 4: Information Systems Research (from Hevner et al. 2004)

The goal of Design Science is always a "purposeful IT artefact created to address an important organizational problem" (Hevner et al. 2004: 82). Hevner at al. (2004) define IT artefacts as constructs (vocabulary and symbols), models (abstractions and representations), methods (algorithms and practices), and instantiations (implemented and prototype systems). Rather than fully realised Information Systems themselves, artefacts are instead innovations that support understanding, designing, building and using information systems (Hevner et al., 2004).

Design Science puts a strong emphasis on design evaluation, preferring quantitative and mathematical models, such as optimisation proofs, analytical simulation, and quantitative

comparisons with alternative designs. These might then be followed by empirical and qualitative methods (Hevner et al. 2004).

Design Thinking and User Experience (UX)

The approaches above show that to both situate our project in a social context and also develop material outcomes is not a straightforward undertaking. Instead, it necessitates bridging a paradigmatic gap that can prove problematic. This is a similar challenge to the one articulated by Barley and Orlikowski between the fields of Information Technology and Organisation Studies as an opportunity for investigating not only the material properties of artefacts but also their social contexts (Barley & Orlikowski, 2001). In design practice, on the other hand, a number of approaches have proved effective at bridging these gaps that can seem insurmountable within the formal rigour of the academy. However, these approaches lack the depth of formal knowledge, particularly with regard to prior social scientific research. Two such approaches are, Design Thinking and User Experience (UX).

Design Thinking exists on a scholarly and practical level, however, both are quite distinct from one another (Johansson-Sköldberg, Woodilla, & Çetinkaya, 2013). Design Thinking research has conceptualised design, neither as meeting a social need, nor as material product, but instead as a "discipline of systematic thinking" (Buchanan 1992: 19). However, crucially, there is "no sustained development of the [design thinking] concept in the academic literature" (Johansson-Sköldberg et al., 2013: 121).

Practitioners of Design Thinking, on the other hand, have articulated a useful process which helps to bridge the gap between the activity and discourses of social research, data synthesis and artefact design. For example, the Stanford D:School method (Stanford D:School, 2015) describes a 5-stage process of *Empathy, Define, Ideate, Prototype and Test*. The first two stages have their roots in the social science, although this is rarely made explicit in accounts. The 'Empathy' phase uses qualitative techniques such as 'observation', 'interaction' and 'immersion' to understand the user's experience. 'Define' is the process of analysis and synthesis of the research findings. Next, the 'Ideate' phase calls for the generation of a large quantity of possible solutions to explore a range of ideas. The 'Prototype' phase concerns the transformation of ideas into physical form in order to allow for learning, interaction and feedback. Finally, the 'Test' phase involves testing and refining a high-resolution product

though observation and feedback with users. Key to the Design Thinking method is that it is iterative and human-centred, allowing for continual feedback and refinement of the artefact.

For User Experience (UX) there is also a "wide gap between practitioners and academics in their understanding of what [it] actually is" (Hassenzahl, 2008: 1). From an academic perspective, UX has its roots in Human-Computer Interaction (HCI) and Computer Science. Current literature in the field of UX often takes a systems engineering approach, attempting to develop methods and frameworks for including user experience using standard engineering methods. This manifests itself in, for example, attempts to conceptualise user needs as one or more product attributes, such as 'accessibility', 'fun' or 'aesthetics'. These then become criteria in the evaluation the quality of interactive systems (Law, Vermeeren, Hassenzahl, & Eds, 2007). This systems engineering approach contrasts with existing UX practice in organisations, in that there appears relatively little acknowledgement of the centrality of user requirements and individual perspectives. UX in practice, on the other hand, is focused on understanding the user and highlights the centrality of qualitative user research before artefact design and development, see for example (UX Mastery, 2014).

Action Design Research (ADR)

Action Design Research (ADR) is a relatively recent approach which aims to bridge some of the gaps articulated in this paper. Sein et al. (2011) describe ADR as "a research method for generating prescriptive design knowledge through building and evaluating ensemble IT artefacts in an organizational setting" (40). Like Design Science, ADR originated from within the Information Systems research paradigm and its aim is to design and build IT artefacts. However, ADR also draws on Action Research to focus on the organisational context, intervention and use in shaping what is termed the "ensemble artifact" (Sein et al., 2011: 37).

ADR consists of 4 stages, each with its own guiding principles and associated tasks. The second and third stages of ADR (after the initial *Problem Formulation* stage) are described using concepts, such as 'emergent' and 'ensembles', that would more commonly be associated with interpretivist paradigms. By merging these two approaches, ADR sets itself the task of addressing two "seemingly disparate" challenges; both the construction of an IT artefact and a subsequent organisational intervention (Sein et al., 2011: 40).

However, prior to the activities of building and evaluating the artefact, comes the *Problem Formulation* stage. Sein et al. (2011) suggest that this should be done both by applying predictive models, under the principle of "theory-ingrained artifact", and by carrying out research of the organisational practice, which comes under the principle of "practice-inspired research" (40). However, there is scant detail on how this latter research should be carried out.

Reflection and Learning is "a continuous stage and parallels the first two stages" (Sein et al. 2011: 44). This phase allows for a "conscious reflection on the problem framing, the theories chosen, and the emerging ensemble is critical to ensure that contributions to knowledge are identified" (44).

Following CAR, ADR articulates the need to develop trust and commitment between disparate stakeholders as a key activity of the *Problem Formulation* stage. Both highlight the importance of a researcher-client agreement which can become the basis for mutual understanding of the scope, focus and mode of enquiry (Sein et al. 2011).

The Decision-Making Process

This paper describes the decision-making process in selecting a methodology for an Industry-Academic research project based on a number of key research needs. Firstly, this research integrates interpretivist approaches with research dedicated to the design and development of artefacts. This involves bridging a gap between interpretivist social science and natural science paradigms, while also incorporating the realities of researcher/practitioner creativity, ideas synthesis and collaboration.

Research Need	Action Research	Canonical Action Research (CAR)	Design Science	Design Thinking/UX	Action Design Research (ADR)
Practical and Theoretical Outcomes	S	Y	Y	N	Y
Social & Qualitative Research	Y	Y	N	Y	S
Reflection & Learning	Y	Y	N	Y	Y
Human-centred Artefact Design, Development and Evaluation	N	N	N	Y	S
Stakeholder Negotiation	Y	Y	N	N	Y

Table 2: A comparison of research needs in relation to methodologies examined for this project

The methodology should support the process of situating the problem in a strong theoretical context to ensure the research remains academically rigorous and can contribute to knowledge in the problem domain. An initial focus on interpretivist research approaches, in particular, qualitative methods (e.g. observations and interviews), is necessary to ensure an in-depth understanding of the specific complex socio-material problem context, including the organisational culture, its infrastructure and people's individual perspectives. The approach should support ongoing reflection and learning to formalise the knowledge, both of the problem context and the artefact being created.

The research methodology should also support the design, development and evaluation of an artefact. This should recognise the emergent nature of the artefact, by supporting an iterative process and based on an in-depth understanding of the organisational context and practitioner needs established in the problem formulation stage, and ongoing evaluation and feedback from the artefact in use.

Finally, the methodology should enable the navigation and negotiation processes needed to ensure that the project takes in to account and interweaves various stakeholder expectations, assumptions and expertise. This ensures that appropriate attention is given, both the immediacy of the organisational-driven, practical imperative to develop solutions, and the methodical reflection required for theoretical innovation.

Table 2 above shows a comparison of each of the approaches against the needs of the research project. Based on the selection criteria, ADR was chosen as the most suitable methodology for this project, having met all of the stated needs of the project, at least to some degree.

INITIAL FINDINGS

We are currently nine months in to a 15-month project. The preceding sections outlined our decision processes in selecting Action Design Research (ADR) as the guiding methodology for our project. The following sections describe our experiences and findings at this point in our research.

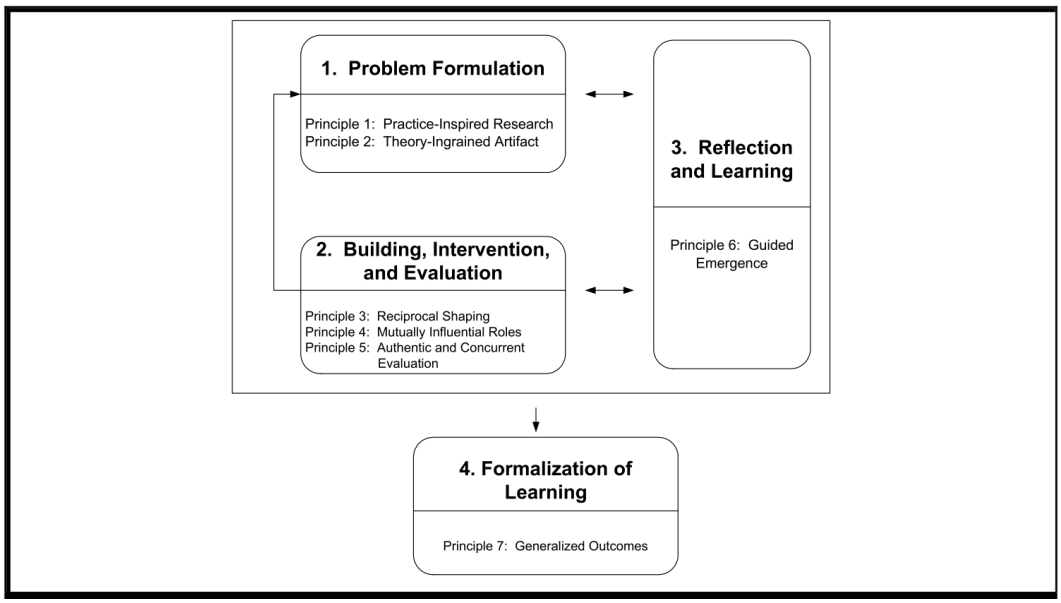

Figure 5: Action Design Research (Sein et al., 2011)

ADR is divided into 4 stages, each with a set of tasks and guiding principles. The bulk of the project so far has been *Problem Formulation* (Stage 1) and *Reflection and Learning* (Stage 3), and we have yet to begin the *Building, Intervention and Evaluation (BIE)* (Stage 2) and *Formalization of Learning* (Stage 4) stages. Therefore, this paper will concentrate specifically on the activities and findings of conducting a project using ADR in the *Problem Formulation* and concurrent *Reflection and Learning* stages.

Stage 1 & 3: *Problem Formulation* and *Reflection and Learning*

Problem Formulation is described by Sein et al. (2011) as consisting of a research impetus or 'trigger', which can come either from practice or from theory. In our case, the trigger for formulating our research effort is "a problem perceived in practice" (40), that of improving capabilities in a complex organisational context. This stage also includes determining the initial scope of the project, assigning roles and formulating the research questions.

Following CAR, ADR articulates the need to develop trust and commitment between disparate stakeholders as a key activity of the *Problem Formulation* stage. Both highlight the importance of a researcher-client agreement which can become the basis for mutual understanding of the scope, focus and mode of enquiry (Sein et al. 2011). Apart from an initial agreement establishing scope and roles, we also agreed to develop a quarterly research

report, which allowed us to communicate changes and emergent understandings with regard to project scope, concepts, theories and artefacts. Additionally, weekly meetings were established as a way of ensuring effective communication and ongoing commitment, as well as providing an additional opportunity for gathering field data. The research team have also been able to maintain personal relationships with key practitioners from the Industry partner by conducting fieldwork and design workshops onsite.

These communication structures have provided opportunities to ensure common understanding and negotiate agreement between various stakeholder perspectives regarding the scope and focus of the project. However, the amount of time and effort that would be required to maintain these relationships was not anticipated at the outset of the project. Although the agreed meetings and reports have proved necessary, we have found that neither has proved sufficient in establishing and actively maintaining trust, commitment and understanding between stakeholders. In practice, many additional interactions and meetings were scheduled as needed to clarify understanding and maintain positive working relationships.

The key emphasis of this stage in the ADR methodology is on situating the problem in a broader class of problems. Our literature review, as outlined above, helped us to situate it in the field of Organisational Change. The two principles of this phase, "theory-ingrained artefact" and "practice-inspired research", reflect the influence of both AR and DS perspectives, highlighting the application of existing theories, as well as the knowledge gained through an emergent understanding of practice (40). While Sein et al. (2011) acknowledge that the initial formulation of the problem may be "coupled with an initial empirical investigation" (40), there is no imperative to do so nor task defined for the activity.

In contrast, we find that in order to understand the technological and social aspects within the organisational context an empirical investigation is a necessity. In our case this included not only semi-structured interviews and workshops, but also in fieldwork using ethnographic methods (e.g. shadowing and observation). This reflects our experience, and the approach of AR and CAR, of the centrality of social research to the problem formulation stage, which can take account of the emergent and tacit nature of knowledge within the organisation and the research team. Additionally, it is in this problem space, rather than in the technical innovation of the artefact, that we hope to make our theoretical contribution. In our case, this empirical

work is rooted in interpretivist theories, rather than models of generalisable and predictive outcomes which presume a stable and bounded environment, as is the case with Design Science research, and implied by ADR's principle of *Theory-ingrained artefact* (Sein et al., 2011).

In contrast, the Organisational Change models identified in the literature review were used as an input to the design of our qualitative research activities, which had three distinct but interrelated aims. First, it was to help us to more clearly formulate the problem. Next, it allowed us to evaluate the theoretical models in the organisation setting. Finally, it constituted the first step in our artefact design process, by allowing us to start to conceptualise solutions for identified problems with organisational participants. In this way we found that the need to carry out the activities of *Intervention* and *Evaluation* from the start, rather than during the following build stage. Therefore, we found that the scope of *Problem Formulation* in ADR was therefore narrower than the activities that were necessarily a part of this stage for our project.

Reflection and Learning is "a continuous stage and parallels the first two stages" Sein et al. 2011: 44). This phase allows for a "conscious reflection on the problem framing, the theories chosen, and the emerging ensemble is critical to ensure that contributions to knowledge are identified" (44). This emphasis has been hugely beneficial to our project, ensuring sufficient time was allocated for continuous reflection and ongoing formalisation of knowledge. At our stage of the project, the emerging ensemble does not yet exist in material form, therefore this stage has primarily included gaining a deep understanding of the organisation context and the existing practices, and, through a process of continuous analysis and synthesis, relating these to the broader class of problem, that of Organisational Change.

The central principle of the *Reflection and Learning* stage is *Guided Emergence*, which states that the ensemble artefact reflects the preliminary design but also its ongoing shaping through use (Sein et al., 2011: 44). This principle suggests that the design exists before the interaction with the organisation. This is not the case with our project, which sought to understand the organisation context before starting the design process. However, the principle still holds true, true, and the early stage designs have emerged from a synthesising of theoretical knowledge, knowledge of existing work practices gained through qualitative research, interactions between the research team and the organisational participants, and individual

contributions in the form of creative ideation. This knowledge gathering phase was then followed by a process of verification and early stage conceptualisation, as our early research and initial artefact ideas were presented to participants for feedback and ideation opportunities, reflecting the early design stages of DT and UX.

The narrow scope of the *Problem Formulation* stage, as well as the need for ongoing intervention and evaluation has also been identified by Mullarkey and Hevner (2015), who conducted an ADR research project to evaluate an online network with the aim of proposing a set of design principles for "an innovative inter-organizational social network information system (IO SNIS) artefact (121). In the case of their research, as with ours, no information system artefact existed in the problem domain being studied (Mullarkey & Hevner, 2015). To resolve this challenge, they propose extending the *Problem Formulation* model to include two distinct activities, that of *Problem Diagnosing* and *Concept Design* (Mullarkey & Hevner, 2015), which is depicted in Figure 6 below. During the course of their research, they also found that "intervention and evaluation occurs at every stage in a robust ADR method" (123).

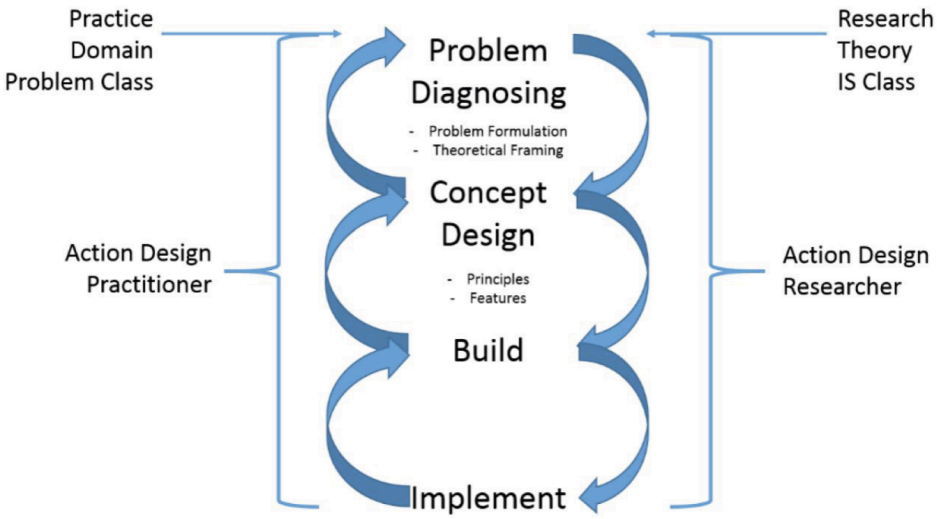

Figure 6: Mullarkey and Hevner (2015) Elaborated ADR Method

Next Phases: *Building, Intervention, and Evaluation (BIE)* and *Formalization of Learning*

The *Building, Intervention, and Evaluation (BIE)* stage builds on the "problem framing and theoretical premises" of stage one (Sein et al. 2011: 41). During this stage, the initial design of the IT artefact is generated and further shaped by organisational use and subsequent design

cycles. As Mullarkey and Hevner (2015) identify, an earlier design phase is necessary prior to committing to a realisation of the design in the *Build* stage. The *BIE* phase of our project will consist of taking the concept designs of the *Problem Formulation* stage and iteratively developing and evaluating them in use. By ensuring that organisational users continue to be an integral in the design and evaluation of emerging artefacts, we hope to enhance the usefulness of the artefacts, but also their potential adoption.

Evaluation, it is acknowledged, can be "difficult to achieve", due to the emergent nature of the artefact (Sein et al. 2011: 44). The primary practical output in this project is the creation of artefacts that will be effective in supporting the organisation's change programme and is based on an in-depth knowledge of the problem context. While there is an opportunity for feedback and input from organisation participants throughout the concept, design and development phases, evaluating the full impact of the artefacts on the complex, organisational environment will not necessarily be evident within the relatively short time frame of this project.

The final stage of ADR is the *Formalization of Learning*, with the single principle of *Generalized Outcomes*. Sein et al. (2011) contend that the problem, the solution and the design principles may be generalised (44). Our primary research contribution is expected to be new knowledge about the broader class of problems (in this case, Organisational Change) and developing the design methodology. The solutions, expressed as artefacts, will primarily have a practical impact in the short term and should provide empirically-grounded theoretical insights in the longer term.

CONCLUSION

Although we are already nine months into the project, we have found that the *Problem Formulation* stage has taken up most of this time. We have found this stage highly informative and productive, but also more complex than described in any of the methodologies, including ADR. For us, *Problem Formulation* has comprised a number of distinct activities, including project planning, stakeholder management, qualitative research and analysis, and initial design conceptualisation. For this reason, we have found Mullarkey and Hevner's (2015) addition of the stage, *Problem Diagnosing* and *Concept Design* to be a very useful elaboration of the original ADR model. However, we find that the *Problem*

Diagnosing stage should be extended to include an explicit emphasis on immersive qualitative research to fully understand the problem context and existing work practices in order to design effective human-centred solutions and contribute to knowledge in the problem context.

We will continue to assess the efficacy and limitations of ADR as a suitable methodology of effective Industry-Academic collaboration as we progress through the subsequent phases of this project. We plan to elaborate an enhanced model to support similar Industry-Academic collaborations hoping to contribute to knowledge and innovation in organisational contexts.

REFERENCES

Armenakis, A. a., & Harris, S. G. (2009). Reflections: our Journey in Organizational Change Research and Practice. *Journal of Change Management*, *9*(2), 127–142. doi:10.1080/14697010902879079

Barley, & Orlikowski. (2001). Technology and Institutions: What can Research on Information Technology and Research on Organizations Learn from Each Other. *MIS Quarterly*.

Barnes, T., Pashby, I., & Gibbons, A. (2002). Effective University-Industry Interaction: A Multi-case Evaluation of Collaborative R&D projects. *European Management Journal*, *20*(3), 272–285. doi:10.1016/S0263-2373(02)00044-0

Buchanan, R. (1992). Wicked Problems in Design Thinking. *Design Issues*, *8*(2), 5–21. doi:10.2307/1511637

Burnes, B. (2004). Kurt Lewin and the Planned Approach to Change: A Re-appraisal. *Journal of Management Studies*, (September).

Davison, R. M., Martinsons, M. G., & Kock, N. (2004). Principles of canonical action research. *Information Systems Journal*, *14*(1), 65–86. doi:10.1111/j.1365-2575.2004.00162.x

Hassenzahl, M. (2008). User experience (UX): Towards an experiential perspective on product quality. *Proceedings of the 20th International Conference of the Association Francophone d'Interaction Homme-Machine on - IHM '08*, 11. doi:10.1145/1512714.1512717

Hevner, A. R., March, S. T., Park, J., & Ram, S. (2004). Design Science in Information Systems Research. *MIS Quarterly*, *28*(1), 75–105.

Johansson-Sköldberg, U., Woodilla, J., & Çetinkaya, M. (2013). Design thinking: Past, present and possible futures. *Creativity and Innovation Management*, *22*(2), 121–146. doi:10.1111/caim.12023

Law, E., Vermeeren, A., Hassenzahl, M., & Eds, M. B. (2007). Towards a UX Manifesto COST294-MAUSE affiliated workshop. *Structure (2007)*, (September 2007).

Lewin, K. (1946). Action Research and Minority Problems. *Journal of Social Issues*. doi:10.1111/j.1540-4560.1946.tb02295.x

Lewin, K. (1947). *Frontiers in Group Dynamics: Concept, Method and Reality in Social Science; Social Equilibria and Social Change*. *Human Relations* (Vol. 1). doi:10.1177/001872674700100103

Lewin, K. (1951). *Field theory in social science: selected theoretical papers*. Harper. Retrieved from http://books.google.ie/books/about/Field_theory_in_social_science.html?id=Q39EAAAAIAAJ&pgis=1

Mullarkey, M. T., & Hevner, A. R. (2015). New Horizons in Design Science: Broadening the Research Agenda. In *DESRIST 2015* (Vol. 9073, pp. 121–134). doi:10.1007/978-3-319-18714-3

Peppard, J. (2001). Bridging the gap between the IS organization and the rest of the business: Plotting a route. *Information Systems Journal*, *11*(3), 249–270. doi:10.1046/j.1365-2575.2001.00105.x

Peppard, J., & Ward, J. (2004). Beyond strategic information systems: towards an IS capability. *The Journal of Strategic Information Systems*, *13*(2), 167–194. doi:10.1016/j.jsis.2004.02.002

Rittel, H. W. J., & Webber, M. M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, *4*(2), 155–169.

Sein, M. K., Henfridsson, O., & Rossi, M. (2011). Action Design Research. *MIS Quarterly*, *35*(1), 37–56.

Stanford D:School. (2015). The Design Thinking Process. Retrieved June 23, 2015, from http://dschool.stanford.edu/redesigningtheater/the-design-thinking-process/

UX Mastery. (2014). UX Process. Retrieved June 23, 2015, from http://uxmastery.com/resources/process/