Using simulation to create a time-bound, space-constrained context for studying decision-making in project portfolio management using the Cynefin® framework

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Abstract

This paper discusses how an emerging awareness of the complexity of project portfolio management (PPM) led to development of a role-play based simulation to test different means of identifying and reflecting on factors influencing the quality of decision making in stressful situations. Recognition of the inability to access reliable data in organisations resulted in development of the simulation called Hooshmand-1; an open and chaordic simulation that replicates aspects of the decision-making processes commonly encountered in complicated and complex conditions. The simulation employs data from a real case study to establish two scenarios of increasing complexity. It draws on the Cynefin domains framework and the concepts of Originating Ba and Interacting Ba spaces to create a research / learning space for creation and analysis of decision making strategies. Initial findings from the research indicate that Hooshmand-1 abstracts the reality of decision making for PPM at an organisational level specifically in relation to time limitations and information constraints. The activity encourages participants to become more aware of their responses to specific constraints, while their actions create data that can be used to analyse the impact of those constraints. The implications of using a simulation-based research strategy are likely to be diverse, and are expected be a welcome addition to the scope of project management research options, especially in conditions where opportunities for direct observation or analysis are not available.

Introduction

Decision-making in project contexts is complex. There are a wide variety of tools (Pendharkar 2014), frameworks (Archer and Ghasemzadeh 1999) and methodologies (Ghapanchi, Tavana et al. 2012) available to project portfolio managers. However, actual decision-making often seems to stray from clear and rational analyses that could be expected to produce objectively ideal solutions. The research reported here was initially prompted by observation of senior decision-makers whose behaviours while operating in high stress conditions indicated an apparent temporary loss of capacity for rational analysis. This research was prompted by the lead author's observation of this anomalous behaviour, and the questions that arose about why those being observed seemed to have lost their previously exhibited capacities for effective decision-making.

The study of decision-making in project portfolio management has attracted attention from researchers because of the increasing uncertainty in business environments (Christiansen and Varnes 2008, Killen 2013). Petit (2012) and Martinsuo (2013) examined sources of uncertainty that affect portfolio decisions . Their research demonstrates the need for further primary data collection about how portfolio-oriented decisions are made in uncertain times. However, gaining access to primary data in such settings remains problematic, especially because of issues such as the confidential nature of organisational strategic information, and the delicacy of dealing with emotionally charged contexts. Thus, there is a need to find a reliable source of data about how relevant decisions are made. In addition, the ability to exercise a level of control over the decision-making process could be of assistance in developing targeted or quasi-experimental research.

This paper describes the development of a simulation designed to replicate conditions under which decision makers' usual standards of analysis may become compromised, and to ascertain whether there are patterns to these anomalous responses. The simulation was specifically designed to highlight non-technical factors operating in high stress situations, and also identifies consequent unexpected, or unacknowledged, impacts on project outcomes. It is one outcome of an Action Learning process used in the lead author's Ph.D. research. This paper describes the approach used to develop the simulation, shows how it enables repeated enactment of contexts to support knowledge creation in portfolio management, and briefly explores how it enables participants to bypass the kinds of defensive routines that frequently inhibit effective decision-making (Argyris 1990).

Principles for simulation development

At its core, simulation is 'the abstraction of reality for a purpose' (Leigh 2013, p. 200) and provides a wide range of opportunities for creating time-bounded and space-restricted contexts for researching project management. Simulation can usefully be considered as a form of 'magic circle' (Klabbers 2007), wherein participants enact familiar activities in a pre-determined context, for learning and/or research purposes. The design emerged from analysis of available literature and existing designs, and represents a unique approach to generating a simulated context within which expert project managers attempt to achieve consensus about decisions relevant to business outcomes.

Simulation is an established research and exploration tool, often found in technical disciplines. For example, simulation has been used in crisis management training (Walker, GIddings et al. 2011) and Operations Management (Zee and Slomp 2009). Simulation is also recognised in the human sciences (Sa. Silva, Pedrosa et al. 2011) as a means of providing tools and guidelines for building formally arranged structures that become temporary knowledge creation spaces allowing researchers to explore specific aspects of human behaviour (see for example Geurts et al. 2000). Simulation creates bounded contexts within which actions, which occur in artificially constructed environments become available for analysis. Such environments are constructed so as to sufficiently replicate recognisable contexts and thus enable participants to behave as if the requirements for action and interactions are factual and real. Principles informing development of this simulation include a) establishing a viable (albeit artificial) context, b) sufficient - but not too much - inbuilt complexity, c) a model replicatig known conditions, d) a means of generating new knowledge, e) without generating the defensive routines which Argyris,(1986) demonstrated often lead to concealment of internal emotional states – especially negative ones.

Design of the simulation is driven by the need to create a context for eliciting information about the influence of complexity and the effect of space and time factors on decision-making processes. In project portfolio management contexts, decision-making complexity is generated by a number of internal and external factors, including the need to select, prioritise and optimise decisions. It is a multiple-objectives problem. Key constraints affecting the process include the existence of conflicting objectives, for example assigning resources among projects that are all linked to strategic plans, or maintaining cost-benefit ratios within the goal of sustaining agreed strategic directions. As such issues become more complex they must to be dealt with in an increasingly wholistic manner (Cooper 1994, Cooper and Kleinschmidt 1995, Archer and Ghasemzadeh 1999, Cooper, Edgett et al. 2001).

The Cynefin framework (Kurtz and Snowden 2003) represents ways in which the need for knowledge moves from simple to complicated to complex to chaotic conditions, each of which requires a different set of responses. As this research is concerned with identifying constraints placed on project portfolio decision-making by the demands of complicated and complex states, the Cynefin framework was considered to be especially relevant. Kurtz and Snowden (2003) define ‘complicated’ state as the zone of knowable information where cause and effect are discoverable, although, separated over time and space. The Complex state involves emergent patterns, where cause and effect relationships do not repeat and are only coherent in retrospect (Kurtz and Snowden 2003). Snowden and Boone (2007) argue that leaders need to understand and apply relevant responses depending on actual conditions, and further assert that misunderstanding the patterns of communication and knowledge result in ongoing problems. The simulation is therefore used to provide situations where participants must respond to an initially ‘complicated’ situation, which becomes ‘complex’ as time passes.

Another significant principle influencing the design was the concept of Ba, a Japanese word for place, introduced by (Nonaka and Konno 1998) as a concept for representing knowledge creation in organisations. They argue that interactions and activities in organisations are sources of knowledge creation and identified four specific aspects to Ba, which they called: Originating, Interacting, Cyber, and Exercising. Originating Ba provides a space for socializing and expressing individual experiences and feelings; Interacting Ba is a space for knowledge creation occupied by selected individuals for collaboration via constructed dialogues; Cyber Ba is a virtual technology-supported space for sharing and combining knowledge; Exercising Ba supports internalization of new knowledge through focused training with the help of experienced mentors. The simulation focused on creating a space for

Originating Ba and Interacting Ba.

A further influence on the simulation was the need to provide a situation where decision-making under complexity could be studied without needing to account for historical relationships among participants. Argyris called the effect of such relationships ‘defensive routines’ and described them thus -

> Defensive routines [are] any policies or actions that prevent the organization from experiencing pain or threat and simultaneously prevent learning how to correct the causes of the threat in the first place (Argyris 1986, P. 541).

Understanding the potentially adverse impact of such defensive routines, explicit controls were included in the simulation design. These controls enabled participants to readily, and honestly, access their thinking and the emotions influencing their actions, without experiencing a strong need to protect themselves from admitting error.

An Action Learning Development Process

Action Learning (Revans 1998) is, as its name suggests a process using learning focused strategies for solving complex problems. It uses a cyclic approach to problem solving beginning with action and moving through reflection on the results to analysis, and then returning to further action. During the course of the doctoral research, of which this is a part, six Action Learning cycles contributed to the development of Hooshmand-1. The first cycle established key project decision factors and principles for inclusion in the final design. Subsequent cycles added to the knowledge base, especially in regard to its use as a research tool. A review of existing simulations identified two designs that might serve as suitable instruments. Each was tested and both are briefly described below.

Wip Wap / Holiday Paradise School: the 2nd Action Learning Cycle

Wip Wap was the result of a collaborative venture between the University of Technology Sydney and the University of Tilburg (Naber and van Oort 2005). It was developed to explore factors influencing communication in an organisational context. It was situated as a Jillaroo Jackaroo school in outback Australia, simulating a year of business planning during a three-hour period. Participants must rescue the school from financial crisis, and face challenges to their competencies for communicating, collaborating and completing assigned tasks effectively and on time, while also responding to unexpected events. The focus is on intra-organisational barriers to information sharing, group decision-making and achieving consensus on decisions.

As part of the Action Learning cycle, Wip Wap was redesigned to mirror a project portfolio management context, and the scenario adjusted to involve fewer participants, and a shorter playing time. The key roles were retained, and there were twelve activities to complete. Participants in a pilot session did not complete any activities within the stipulated time. These adaptions to Wip Wap indicated that:

1. The context did not sufficiently represent a portfolio management environment;
2. The focus on decision-making processes and conditions were not sufficiently similar to how they might occur for project portfolio managers;
3. The range of behaviours in the simulation was too broad to demonstrate relevant patterns; and
4. The simulation took too long to complete.

AirPower 2100: 3rd Action Learning Cycle

AirPower2100 was developed to improve fleet preparedness at an Australian Air Force base; a large and diverse work place (Kearney, Heffernan et al. 2013). The main focus is on relationships among four groups: logistics, maintenance, operations, and Aircraft Upgrade Projects (Figure 1).

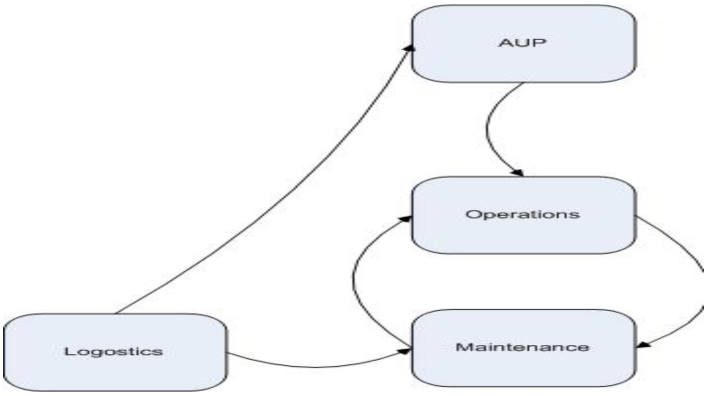

Figure 1: The relationship between roles in AirPower2100

To represent this space the simulation uses a diagrammatic representation of work tasks and poker-like chips to replicate workflows involved in maintaining combat readiness. Figure 2 is an image of the board and chip set, and indicates the direction of workflow among divisional requirements. AirPower2011 takes three hours to play and was designed as part of a tailored education program to improve strategies for continuing availability of battle ready aircraft (Kearney, Heffernan et al. 2013P. 1).

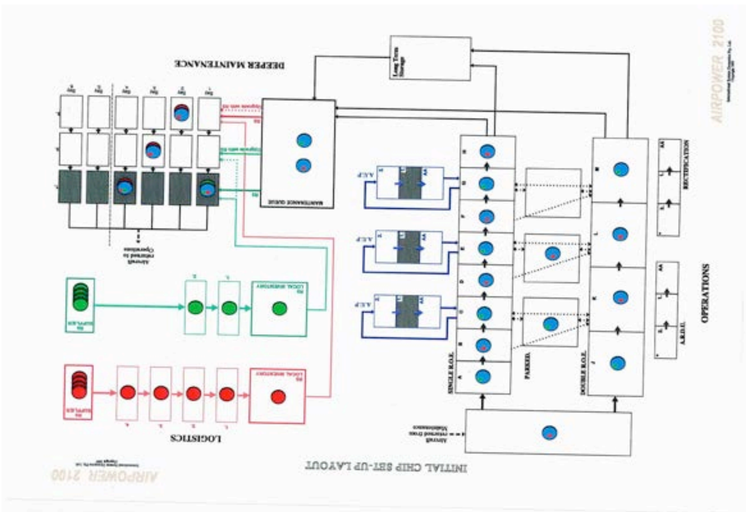

Figure 2: AirPower2100 playing board

Since the nature of decision-making in such a context shares many similarities with project portfolio management, AirPower2100 was a candidate to study the impact of complexity on project portfolio decision-making. A play through exercise to review its suitability demonstrated that:

1. this style of simulation was too structured to allow for customization;
2. the resource flow model was not compatible with a portfolio management environment; and

3. the three hour time frame did not allow for the research processes required.

Portfolio Selection: 4th Action Learning Cycle

Portfolio Selection is a classroom simulation for business students. The researcher attended two sessions as an observer and as a player to appreciate the process and knowledge of portfolio selection used. The activity studies how methods of presenting information influences individual perceptions about making decisions. Individuals had 15 minutes to make a decision and then discuss with the group their perceptions of how they made the decision. In each group, participants had the same data, which were differentiated by the group colours. Analysis demonstrated that key decision criteria were relevant for design of simulation, and the average time of 15 minutes for decision-making proven an appropriate timeframe for simulation scenarios.

Hooshmand-1: Action Learning Cycles 5 and 6

As an appropriate simulation for the research goals could not be found, Hooshmand-1 (meaning 'Intelligent' in Persian) was developed to study decision making processes in project portfolio management. The simulation was specifically tailored to facilitate the study of how decision making is affected by three sources of uncertainty: time pressure; detailed, intricate information; and, the uncertainty of achieving desired outcomes.

An abductive research approach (Dubois and Gadde, 2002) was used to make sense of the evidence collected during the previous Action Learning cycles. Abductive research is used to produce scientific accounts of social life by drawing on concepts and meanings used by social actors and the activities in which they engage (RMIT, 2015, P. 3). This is relevant in the context of designing and using a simulation for research, in that Hoohmand-1 creates a standardised sequence of actions needed for reliable, repeatable patterns of behaviour to emerge. These actions enable collection of sufficient research data and provide contrasting data points. The simulation involves two short scenarios. Real time disruptions in the second scenario increase complexity and uncertainty. Participants are given simple decision criteria and a simplified organisation structure, to minimise the set-up time. Use of an abductive research strategy created a six-step simulation process -

1. Briefing;
2. 1st simulated scenario;
3. Reflection on the 1st scenario;
4. 2nd simulated scenario;
5. Reflection on the 2nd scenario; and
6. Debriefing.

The two scenarios use data from a case study of IT companies in Canada (Petit 2012). Both are set in the (fictional) Sydney headquarters of an international IT company, in the context of a project portfolio committee meeting of the headquarters director and division heads of Application Development and Integration and Verification. The scenarios are dynamic and competitive, with sources of instability related to product content, unstable standards and unclear product requirements from the customers.

The data provided to the meeting indicates essential dependencies among sub-projects, and a limited resources pool that needs to be allocated to more than one project, because of high-demand competencies. Scenarios were written so that projects overlap to maintain a stable design base, and some cannot be started or must be delayed if resources are held by higher priority projects. This creates competition, which must be resolved to ensure progress on all projects. Dependencies between projects are also introduced.

The scenarios represent decision-making during a 24-month financial period. Details include indicative figures for resources required and the strategic fit of each project. The first scenario occurs during the first quarter of the two-year cycle, and the committee has three months (represented by minutes in simulation time) to report how they will adjust their portfolio to reduce costs while maximizing strategic fit and benefits. The second scenario occurs during the second quarter and the committee receives a second list of projects, which they must prioritise to maximize profits given time and resources constraints.

A short timeframe was found to be vital to replicate real time pressures. Each 10 minutes of action equaled a month of real time and teams must publish their decisions within three months (30 minutes of game time). No effort was made to simulate the physical space in which portfolio decisions are made. Instead, the sense of space was that of a decision space, embodied more in the documentation that participants reviewing and their discussions, than in the specifics of a physical environment.

The development process follows principles generally applicable to simulation design, identified by Leigh and Kinder (2001) as having five essential components -

1. Rules: to form the boundaries for action;
2. Roles: guiding how participants think and act during the action;
3. Scenario: outlining the story and setting for the action;
4. Recording: focusing attention on the goals of using the simulation; and
5. Validity: assessing the realism of ways in which these factors operate as a whole.

Leigh and Kinder (2001) identified three phases for moving participants through the process:

6. Briefing: participants are introduced to the components in a manner relevant to both the needs of the research and the format of the design;
7. Action: participants are in control of all that happens, with the researcher/facilitator having only residual authority to intervene; and
8. Debriefing: participants are invited to reflect on and discuss the events and interactions they co-created. 'Debriefing' can be inserted more than once during the action, but each episode must be preceded by cessation of all 'Action', which is then re-started after the debriefing.

Hooshmand-1 as a research instrument

Four sessions of Hooshmand-1 have involved 33 participants in Australia and Iran. Participants were selected through a volunteer expression of interests to the simulation flyers. Participation was restricted to professional project managers with at least three years experience. Workmates were allocated to separate teams, reducing the probability of existing relationships interfering in the decision process, and participants with similar industry backgrounds work in separate groups to achieve maximum diversity. These arrangements facilitated the emergence of Interacting Ba by grouping people mindfully on the basis of diverse knowledge and backgrounds.

For the research process a recording system was incorporated using audio and video media. SenseMaker software helped participants signify their learning points after each scenario (Sardon and Wong 2010). For this research the first feedback cycle asked participants to signify their experience of the scenario using a micro-narrative - a short section of text triggering contextual awareness (Cognitive-Edge 2012). The validity of the scenario and decision process was checked in the reflection and debriefing steps. Participants were asked to assess how the scenario, reflected their workplace experiences. Most participants indicated a high degree of similarity between their real world experience and the two scenarios, suggesting a high degree of verisimilitude. Thus far validation indicated the simulation successfully created originating Ba and interacting Ba through use of crafted constraints.

Conclusion

This paper describes the use of simulation as a research methodology for studying PPM based on the Cynefin framework. A sense of urgency was created by setting time constraints for making decisions to replicate real situations and creating a space (Ba) to enhance learning.

The study demonstrates that a simulation helps unlock creativity to overcome complex decision-making challenges. It is anticipated that the learning acquired can help participants overcome defensive routines and improve decision-making. Setting up the study required several trials to establish a robust simulation to replicate the real situation in PPM as closely as possible. An action learning approach helped structure the plan-act-observe-reflect cycles, to continuously improve the simulation process.

The use of the Sensemaker software is an innovative approach to data collection, and will be reported on in future papers. This research demonstrates that replication of a real organisational situation via a simulation is an effective methodology.

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