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A framework to manage uncertainty in early planning of projects, an ICT project

Dr Saeed Shalbafan, PhD, PMP, MIEA, UTS, Faculty of Built Environment, Senior Advisor to NSW Government and Founder of Hooshmand-Intelligence Advisory
Saeed.Shalbafan@hintplex.com Corresponding Author.

Kim Ballestrin, Principal Consultant in Elabor8

Abstract

Identifying sources of uncertainty and tailoring decision-making approaches to meet specific contexts, creates opportunities to reduce effort expended in the early planning phases of project planning. Practical application of these approaches in not yet being widely reported in research on Business Case and Decision-making Frameworks, so this paper seeks to fill the gap by describing an approach based on the Cynefin Framework (C. F. Kurtz & D. J. Snowden, 2003; Snowden, 2018) which distinguishes between complicated and complex decision contexts based on the types of operational constraints (governing and enabling) and nature of practices involved (good and emergent). Recognising the differences during project initiation, improves accessibility to streamlined decision-making, by ensuring 'fit-for-purpose' methodologies are chosen rather than relying on an undifferentiated single method. This paper describes how use of the Cynefin framework, during initial project planning, enables better alignment of plans with situational constraints, and ensures effective calibration of plans to meet required outcomes.

Keywords. Cynefin, Complex project, ICT, uncertainty, business case, planning, decision framework.

Introduction

In the initial planning phase of projects - especially those with multiple stakeholders and intricate sets of outcomes, there are opportunities to avoid wasted effort through considered application of the Cynefin Framework (David J. Snowden & Mary E. Boone, 2007), used as a categorisation model to address ambiguity in goals and scope definitions through tailoring approaches for problem solving and disagreement resolution. Planning conversations can be easily derailed when issues associated with complex and complicated problems are mixed together such as happens in analysis-style workshops, or reliance on experts sorting through the issues to arrive at recommended action strategies. Derailment often occurs when workshops and meetings planned to last a couple of hours result in ongoing conversations and disagreements lasting sometimes for weeks or months.

Sources of complexity have been identified in regard to research on projects (Remington & Pollack, 2008a), business case frameworks (van Putten, Brecht, & Günther, 2013) and linked to the degree of uncertainty associated with interpreting real-world events via use of case studies (S. French, 1995b).

This paper reports insights emerging from use of the Cynefin framework during the early planning phase prior to developing the business case for an ICT project. The approach allowed team members to categorise the types of decisions required in early planning, consequently allowing tailoring of the decision-making formats to suit differing levels of uncertainty and complexity for each item. This resulted in a significant reduction in the effort required to make key decisions, allowing a set of decisions that had remained unresolved for 3 months to be finalised in two days.

Relevant theoretical background —including the theory of complexity, navigation of uncertainty, the Cynefin Framework itself and decision making methodologies—is introduced and the methodology for implement the approach in a particular ICT project is described before the outcomes are explained. A concluding discussion illustrates the connections between practice and theory.

Complexity and Uncertainty

Complexity and uncertainty are acknowledged as regular disruptors of decision making, especially when senior managers are required to make decisions without the availability of sufficient information (Gorzen-Mitka & Okreglicka, 2014) conditions which usually happen during the early stages of planning new projects. To better understand such complexity Remington and Pollack (2008b) identified four types of project complexity: structural; technical; directional; and temporal. Directional uncertainty arises from uncertainty and lack of agreement about project goals, and stakeholder disagreements: unshared goals, unclear meanings and hidden agendas (Remington & Pollack, 2007, p. 7). When technical and directional complexity are not well managed the result is prolongation of early planning and emergence of wicked problems. Mis-managing technical complexity in early planning leads to over estimation of requirements or poor understanding of values and benefits realisations (Ward, Daniel, & Peppard, 2008). A framework has been proposed for managing complexity of projects in the initiation phase through breaking down key decisions into 15 areas. This is relevant to creating a business case for large IT Projects and table 1 (van Putten et al., 2013) sets out three categories for key topics relevant to the final decision. Reuse topics indicate use of information from similar business cases; Adaptation topics refer to items which can be adapt from previous business cases and Collaboration topics are those where project teams can collaborate to generate specialised information for each business case.

Topic	Reuse	Adaptation	Collaboration
Reuse of content	X		
Reuse of structure	X		
Aggregation	X		
Comparison	X		
Provider vs. Customer Perspective	X		
Market Potential Estimation	X		
Changing Assumptions		X	
Product Innovation Lifecycle		X	
Business Model Adaptability		X	
Topic	Reuse	Adaptation	Collaboration
Clarifying Reasoning			X
Stakeholders 'opinions			X
Information Sources			X
Information Quality			X
Sharing			X
Security			X

Table 1 – Research areas within the solutions for a business case framework [from van Putten 2013]

Whilst these topics resulted from implementation of a Business Case Framework (BCF) over a 14-month period, the quality of information developed during creation of the business case was fine questionable and even ambiguous. And this ambiguity, if unresolved during early planning for adaptation and collaboration, can turn into wicked problems (Childs & McLeod, 2013) needing further research to establish the actual requirements for particular frameworks for action.

Conversely Table 2 (adapted from S. French, 1995a) categorises the types of uncertainty identified during analysis of a real-world example. This categorisation framework provides indicators to detect sources of uncertainty in an inductive process of making sense from a real-world case study (Simon French, 2017).

Table 2 lists four types of uncertainty likely to create complexity in early planning stages, however, there is, as yet, limited application to practice of the frameworks discussed in this section. Furthermore, while mechanisms to manage uncertainty and their application to early planning wicked problems are important, they too are yet to be fully integrated into contemporary practice.

Sense-making - Uncertainty *about*	• meaning / ambiguity • what might happen (the science) • Likely potential impacts (values) • released decisions
Analysis - Uncertainty *because of*	• physical randomness • lack of knowledge
Analysis - Uncertainty *about the*	• evolution of future beliefs and values • accuracy of calculations
Induction - Uncertainty *about*	• depth to which to conduct an analysis

Table 2 – sources of uncertainty (adapted from S. French, 1995a)

Navigation of Uncertainty

Uncertainties are usually events beyond the analysts' ability to predict, and thus cannot be measured in terms of risk (Quade, 1989). Quick-changing environments are a reality of business environment, and the kinds of uncertainties called 'Black Swans' (Taleb, 2007) can derail business operations. Sudden changes influence decision makers' perceptions about choosing actions and identifying decision criteria. Christiansen and Varnes (2008) suggest that decision makers have to deal with multiple criteria and sometimes conflicting interests at the same time. Thus, decision makers often find themselves moving away from rational thinking and towards intuitive thinking (Huang & Pearce, 2015) inevitably adapting a sub-optimal problem solving approach (Shalbafan, Leigh, Pollack, & Sankara, 2017).

Seeking to make sense of complexity leads to more proactive identification of sources of uncertainty and a watchfulness for early signs of failure. In this regard Kallelman, Mckeeman and Zhang (2006) and Weick (1995) argued that people apply sense-making as a tool to overcome ambiguity and associated interpretations of such conditions. Access to a framework for making sense of complex situations can help planners to manage uncertainty in the early planning stages. "Cynefin provides a framework in which to discuss different forms of uncertainty from the deep uncertainty through the growth of knowledge as we learn about the world" (Simon French, 2017`, p. 1636).

Cynefin framework

According to Kurt and Snowden (2003), the Cynefin framework provides ways to open up discussions, identify barriers, stimulate attractors and encourage dissent and diversity, thus enabling planners to better manage starting conditions, monitor for emergence of uncertainties and manage complexity in order to find the appropriate actions to stabilise uncertain conditions.

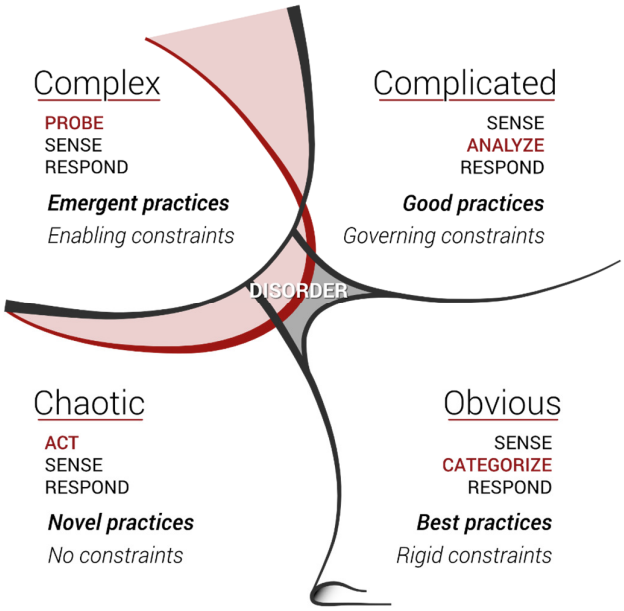

Figure 1- Cynefin Framework (Cognitive-Edge 2019)

Figure 1 is a current depiction of the Cynefin framework including the domains of Obvious, Complicated, Complex and Chaotic and the central condition of Disorder. Table 3 illustrates characteristics of the Cynefin domains as they were adapted in the analysis conducted for this research. The use of a Cynefin framework to analyse complex and complicated domains and fluidity of decision making approaches is discussed in the context of managing multiple projects in Childs and McLeod (2013) and Shalbafan and Leigh (2017).

Complicated

The context's Characteristics	The Leader's Job	Danger Signals	Response to Danger Signals
Expert diagnosis required Cause and effect relationships discoverable but not immediately apparent to everyone; more than one right answer Known unknowns Fact-based management	Sense, analyse, respond create panels of experts Listen to conflicting advice	Experts overconfidence in their own solutions or in the efficacy of past solutions Analysis paralysis Expert panels Viewpoints of non-experts excluded	Encourage external and internal stakeholders to challenge expert opinions to combat entrained thinking Use experiments and games to force people to think outside the familiar

	The context's Characteristics	The Leader's Job	Danger Signals	Response to Danger Signals
Obvious	Repeating patterns and consistent events Clear Cause and effect relationships evident to every one; right answer exists known knows Fact-based management	Sense, categorise, respond Ensure that proper processes are in place Delegate Use best practice Communicate in clear, direct ways Understand that extensive interactive communication may not be necessary	Complancey and comfort Desire to make complex problems simple Entrained thinking No challenge of received wisdom Overreliance on best practice if context shifts	Create communication channels to challenge orthodoxy Stay connect without micromanaging Don't assume things are simple Recognise both the value and the limitations of best practice

Table 3- Adapted from a Leader's Guide (David J. Snowden & Mary E. Boone, 2007`, p. 73)

This article aims to present how an application of familiar language representing three domains in the table 3. This approach helped an ICT Project team to categorise critical decisions and adapt appropriate approaches for each set of decisions by aligning as either obvious, complicated or complex problems. This is an original approach to researching the concepts within a single project.

The story of an ICT Project

Experiment and design of methodology

The Cynefin Framework (Cynthia F. Kurtz & David J. Snowden, 2003) is a great tool for early project planning and decision-making (Shalbafan et al., 2017). In approaching the project, it was decided that team members could best benefit from its principles by using common (non-technical) words to connect participants' knowledge of factors emerging in the context to the theoretical framework. After consultation with key stakeholders, the decision was made to use a trio of common terms suited to the project and the team. Thus, the Obvious domain was identified as Easy, the complicated domain was designated as requiring Analysis, and the complex domain became the Can of Worms. Use of these terms meant the principles behind the Cynefin Framework could be applied immediately without a detailed explanation being required (Ballestrin, 2015). If project team members wanted to learn more about the underlying principles, the full Cynefin Framework explanation could be explored later.

This Easy / Analysis / Can of Worms approach uses familiar terminology and definitions that are quickly understood. The three terms were initially chosen 'at the moment' of time-pressure to start a project and are now used in workshops and conference presentations as a practical explanation of

the Cynefin Framework. The term 'Can of Worms' has been particularly well-received. In one instance, after the approach was outlined to a team, there were reports of it being used in the very next meeting to challenge an item threatening to derail the conversation by identifying it as a 'can of worms. At first the approach was applied to lists of items of work required to deliver a project so that workshops and other early project activities used time more effectively during business case development. However, it has been found to apply broadly to other sets of activities with various levels of un/certainty. Prior to the development of this approach, it was common to hold 4-5 days of workshops with 10-15 participants in order to 'discover' the work needed to complete the project. The Easy, Analysis, and Can of Worms approach means that much smaller and shorter workshop activities can be designed and the project team members assigned to 'Easy' types of decisions can be freed up to get on with other work.

Revised Project Methodology

in terms of 'methodology' the shift to using proxy definitions for the relevant three Cynefin domains creates enabling constraints (Juarrero, 2015) and allows project team members to more easily categorise work items into increasing levels of uncertainty.

- Easy – is proxy for the Obvious domain where there is one best practice and we can use the pattern Sense, Categorise, Respond. The description - as applied to project planning is 'We can name a person we can speak with and in a conversation of 20 min or less they are likely to tell us that it will take X long and cost Y much'
- Analysis – is proxy for the Complicated domain where there are often several good ways to achieve an outcome and we can use the pattern Sense, Analyse, Respond. The description as applied to project planning is 'We can name the experts that we could give the work to; or we can design a workshop of 2-3 hours and by the end of the analysis we would have a scope with which we can determine cost and timeframe.'
- Can of Worms – is proxy for Complex where the linkages between cause and effect are not easy to determine and we need to use the pattern Probe, Sense, Respond. The description applied to project planning is 'Everything that does not fit into Easy or Analysis.'

Once all the known items of work are categorised, project activities can be planned because the people to be involved can be aligned with the work assigned to each of the 3 categories. For example, if the same group of experts is required for all analysis items, one large workshop can be facilitated to tackle all - and only - the relevant items.

The Results

Commencement of the ICT project, which is the basis of this paper had been was stalled because of lack of clear and agreed decisions about new software elements to be included.

In order to keep focused on the work, proxy definitions were used for three of the Cynefin framework domains.

The organisation had an aging technology stack that was mission-critical and required to operate 24 x 7. It required replacement because any new features and updates added to the systems increased the risk of catastrophic failure, it was at 'end of life' for systems support. For 3-4 months there had

been an architectural white paper circulating and no clear decision about the new technology choices for the replacement systems. The desired technology would make it easy to implement continuous delivery and automated release management.

A set of 140 technology decisions were documented by a continuous delivery expert consultant. These were determined based on several workshops and conversations to determine the nature of the issues with the current technology stack and the desired functionality keeping the mission-critical functions and removing the fragility associated with the decades-old legacy codebase. These questions were then classified in collaboration with the lead enterprise architect using the proxy definitions as described above, for the three critical domains in the Cynefin Framework.

- Easy - meant that the technology question could be answered in less than 20 minutes and often would be related to the SOE (Standard Operating Environment). For example, 'Do you use Windows or Linux?'
- Analysis meant that it was agreed that a team of known experts could discuss the question and the length of the discussion could be estimated with confidence (maximum 1 hour)
- Can of Worms meant everything else. For example, when answers began with "I think…" or the length of analysis conversations could not be estimated, the issue automatically became a Can of Worms

A 2-day workshop was designed to tackle all the remaining Analysis and Can of Worms decisions (there were only about 10 'Easy' questions).

Day one was scene-setting so that the 20 or so attendees fully understood the desired outcomes for the technology replacement project.

On day two, there were 3 teams of experts in one room answering the Analysis questions and in a separate room, all the other attendees addressed the Can of Worms (Complex) questions.

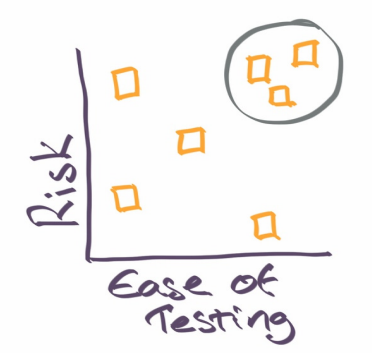

Figure 2 – Prioritisation of assumptions for each decision/question

Figure 2 shows that the group identified assumptions about the question, placing them on a grid indicating low to high risk. If the assumption was invalid, Risk would increase on the Y-Axis and the Ease of testing would increase on the X-Axis. A key success factor was that the group tackling the Complex questions did not have to be experts in software architecture. It is much easier for non-experts to articulate assumptions because the role of an expert is to provide the answer. In the top right corner were the assumptions that were high-risk if invalid and easy to test. The group then called experts, searched the internet etc. to determine if the assumption was valid or invalid and this drove enough certainty into the question for it to be delivered to the teams of experts for an answer.

Discussion

By the end of the 2-day workshop, all 140 questions were answered and the project to replace the aging technology had a good enough starting point. Until the execution of the two-day workshop, the project had stalled due to the lack of clarity about which technology could be used for the replacement systems.

The Easy, Analysis, and Can of Worms (EAC) approach uses the Cynefin Framework as a classification tool by imposing a definition of the Obvious, Complicated and Complex domains so that they become enabling constraints for project planning.

Table 4 shows key expected actions for decisions in each category. This allowed us to blend techniques for project planning. In the case study we were able to very quickly decide the Easy items and then ensure that we keep the Analysis and Can of Worms items isolated from each other.

Category	**Typical Actions**
Easy (Obvious)	Identify the people who can provide the information and create a schedule for those conversations/ tasks
Analysis (Complicated)	Identify the people and groups that have the required expertise and plan/schedule workshops or other analytical activities
Can of Worms (Complex)	Keep these isolated from the other activities to avoid the risk of derailing that work and then design 'probes' or experiments with very rapid feedback cycles to explore the items and move them across to the Complicated or Obvious domains

Table 4- Actions expected in each category of EAC approach

It has been observed that most workshop styles are suited to analysis (Complicated) decision-making and that when a can of worms (Complex) topic arises, the workshop can be derailed, sometimes for weeks. Complex topics require special design to allow for surfacing and testing of assumptions. The workshop used in this case study, was one of successful approaches to explore complexity effectively.

The workshop described was designed to move the Complex decisions into the Complicated domain by surfacing and testing assumptions for validity/invalidity. This process drove sufficient certainty into the question that the teams of experts could answer it. This is a common movement pattern on the Cynefin framework and with the aim of ICT projects being to use technology to deliver an outcome, it is one of the key patterns that is useful to the early planning of projects.

This case study demonstrates a way to effectively manage uncertainty in a complex ICT project. Table 5 shows the main causes of uncertainty in the case study and the impact from applying the EAC model to facilitate making complex decisions. were in the Sense-making and Analysis stages.

- There was uncertainty about related decisions – the architectural whitepaper had stalled because it was a set of complex inter-related decisions about what types of software could provide the required functional and non-functional needs.
- There was uncertainty about lack of knowledge – the project team had insufficient experience and expertise with modern software to be able to determine a good enough starting point

Stage	Sources of uncertainty relevant to each stage	Observation in the ICT Project
Sense Making	Uncertainty about meaning / ambiguity	The EAC framework helped to manage ambiguity by applying targeted approaches to each category of decisions
	Uncertainty about what might happen (the science)	N/A
	Uncertainty about how much impacts matter (values)	N/A
	Uncertainty about related decisions	All 140 decisions were related to identification of the new technology required for the project. The EAC framework removed some of this uncertainty by grouping them and treating the types of decisions differently
Analysis	Uncertainty because of physical randomness	N/A
	Uncertainty because of lack of knowledge	The 'can of worms' category identified the decisions that could not easily be answered by experts (the people who had the knowledge) and the facilitated approach to identify and test assumptions meant that people without expert knowledge could make progress with the decision until it had enough certainty for the experts to answer it
	Uncertainty about the evolution of future beliefs and values	N/A
	Uncertainty about the accuracy of calculations	e.g. Not applicable to this case study
Induction	Uncertainty about depth to which to conduct an analysis	N/A

Table 5- EAC model impact on decision makers in early planning decisions

The Easy, Analysis, Can of Worms approach provided a clear pathway of facilitation for the 140 key decisions to be made. Had this approach not been taken, there was a high likelihood that the project would have been delayed further due to the mixing of complex and complicated questions. When a group is focused on analysis and a 'can of worms' comes up, it halts the progress on the analysis component and leads to the feeling of 'spinning wheels' as conversations go around in circles. Another data point was also captured as part of this case study. There had been many observations of 'can of worms' topics derailing analysis work – however, at one point during the workshop, a couple of the analysis experts walked over to the 'can of worms' room to see what they were doing. They nearly disrupted the session when they started to ask the group why they had not considered this or that about a particular question and were very quickly asked to leave. The thinking required to surface, and test assumptions is completely different to that needed for analysis and it is not effective nor efficient to mix the two together.

Topic	Reuse	Adaptation	Collaboration
Reuse of content	N/A		
Reuse of structure	NA		
Aggregation	N/A		
Comparison	N/A		
Provider vs. Customer Perspective	N/A		
Market Potential Estimation	N/A		
Changing Assumptions		N/A	
Product Innovation Lifecycle		N/A	
Business Model Adaptability		N/A	
Clarifying Reasoning			O
Stakeholders 'opinions			O
Information Sources			O
Information Quality			O
Sharing			O
Security			N/A

Table 6- Observed impacts of using EAC model on BCA Framework

Referencing the Business Case Framework, Table 6 shows those elements which were observed with letter O and NA for not applicable. This case study reflects elements from the collaboration area

- Stakeholders opinions - prior to the engagement, the white-paper reflected the stakeholder opinions about the required new technology
- Clarifying reasoning - the consultation clarified the current technology landscape and classifying the set of 140 decisions identified effective collaborative approaches to finding the answers
- Information sources – for the Analysis (Complicated) decisions, the experts held the information and for the Can of Worms (Complex) decisions, many information sources were used collaboratively to drive sufficient certainty into the decision so that it could be determined by experts.

Conclusions

Whilst Planning for projects can go beyond a complicated problem into complex or chaos domains, the paper provides insights how implementation of the categorisation model known as Easy, Analysis, Can of Worms (EAC) can facilitate critical decisions during early planning. EAC has provided a collaborative approach to extend stakeholders opinions, the through consultation with diversified expertise and increased certainty on sources of information in order to help decision makers with approval of final business case.

The case study was used from an ICT project, and data and the model were analysed against Cynefin Framework, business case framework and the categorised sources of uncertainty to interpret real-world in a case study.

The paper concludes the EAC model as an effective categorisation model for complex decision making and early planning for projects. “Fixing deep uncertainties or strong disagreements about societal values in interesting scenarios might help us inform debate and make sense of very complex issues” (Simon French, 2017`, p. 1643). Further assessment of the model across different industries can result in generalisation of the EAC as a viable ad-hoc to the business case framework for planning purposes.

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