

Title: Critical Systems Practice as a tool to aid complex project management

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Summary:

The aim of this developmental paper is to report on the initial findings of an action research project exploring how systems theory could support the delivery of complex projects. The paper begins with an overview of systems thinking and how it could support the delivery of complex projects. It identifies that a methodology called Critical Systems Practice may offer some value however notes there is limited evidence of how the methodology could be utilised within a project delivery context. The preliminary findings from the first of three action research cycles are then discussed along with details of how these findings have influenced the direction of the subsequent research activities. The paper concludes with reflections on the suitability of systems thinking to support managers of complex projects and details of how the paper will continue to develop prior to the conference.

Track: Project Experiences

Word count: 2540

Introduction

Projects are increasingly described as complex, with this complexity being associated with decreases in project performance and unintended consequences (Crudgington, 2020). As a result, there is a growing focus within the field of project studies to understand the impact that complexity has on project delivery and identify how project management methodologies should evolve in response (Daniel & Daniel, 2019; Locatelli et al., 2014; “The DECA: Understanding Challenges in Delivering Project Objectives,” 2013; Walker & Lloyd-Walker, 2019). Whilst the proliferation of digitisation and the increasing application of artificial intelligence are key areas of focus in this area (Pérez et al., 2022), there is also a growing acknowledgment that the benefits derived from advances in technology may only be realised when the complex contextual challenges in which projects exist are also understood (Klein, 2016). Systems thinking has been proposed as a possible approach for assisting in this area for a number of years however it has yet to gain traction within general project management practices with the exception of a limited number of specialist sectors (Emes, Michael & Griffiths, 2018; Reynolds & Holwell, 2010; Yeo, 1993).

The aim of this developmental paper is to describe research that seeks to address this knowledge gap through the exploration of the application of a systems methodology called Critical Systems Practice (Jackson, 2019). The paper will first provide an overview of Critical Systems Practice and describe how the methodology could aid with the management of complex projects. It will then provide a summary of the preliminary findings from an action research project assessing the application of Critical Systems Practice within a complex project context. This will be followed by a discussion about how the findings have informed the subsequent research activities and details of how the paper will be developed before the conference.

Project complexity and systems thinking

The application of systems thinking by project management practitioners does not appear to be high. A report published by the Institution of Civil Engineers (Crudgington, 2020) identified a pressing need to apply systems thinking to major construction projects as a way of addressing recurring poor performance. In the report, a model for the application of systems thinking specifically to construction projects was provided as a means of promoting systems thinking within the construction industry. The Association for Project Management has also published a report (Emes, Michael & Griffiths, 2018) that identifies numerous systems thinking tools that could be used by project management practitioners irrespective of the industry, but highlight that systems thinking does not appear to be widely understood or applied outside of a few high-tech industries.

A major challenge in selecting a applying systems based tools is that any single analysis approach leads to the potential over-simplification of the situation and is limited by the subjective and incomplete views of the person conducting the analysis (Gonçalves, 2019). This can introduce errors into the assessment and may result in interventions that fail to resolve the problems and in some cases even exacerbate the situation making it more complex (Adams & Hester, 2012; Hester & Adams, 2014). Critical Systems Practice is a methodology, based on systems theory, that offers a potential approach for overcoming some of these errors by prompting a multi-perspective (multi-paradigm), multi-systems method assessment of the situation (Jackson, 2020b).

Whilst much has been written about the theoretical and philosophical justification for such an approach (Jackson, 2019, 2020c, 2020a; Turner et al., 2010) there is limited evidence of descriptive methodologies for engaging project practitioners in practice. For systems based methodologies, such as Critical Systems Practice, to be accepted as approaches for assisting with project complexity there is a need to provide an understanding of how project teams could employ the methodology, associated limitations, and provide exemplars of applications.

It is not within the scope of this developmental paper to provide a detailed discussion of the merits and limitations of systems theory or specific systems methodologies however it is acknowledged that this will be included in the full paper. Instead, what follows is a summary of the development and application of the Critical Systems Practice and details of how the research is assessing the methodology within a complex project context.

The application of Critical Systems Practice

Critical Systems Practice evolved from 'Total Systems Intervention' (Flood & Jackson, 1991) in response to identified limitations of prominent systems approaches such as Systems Engineering and Systems Dynamics (Jackson, 2019, 2020c). The most recent development in this area has been in the development of the EPIC model detailed at figure 1 which describes how Critical Systems Practice can be applied to analyse and develop strategies for understanding and responding to complex situations. The output from the assessment is the identification of primary and secondary issues that can be addressed through the application of an intervention strategy that draws upon a range of systems methodologies.

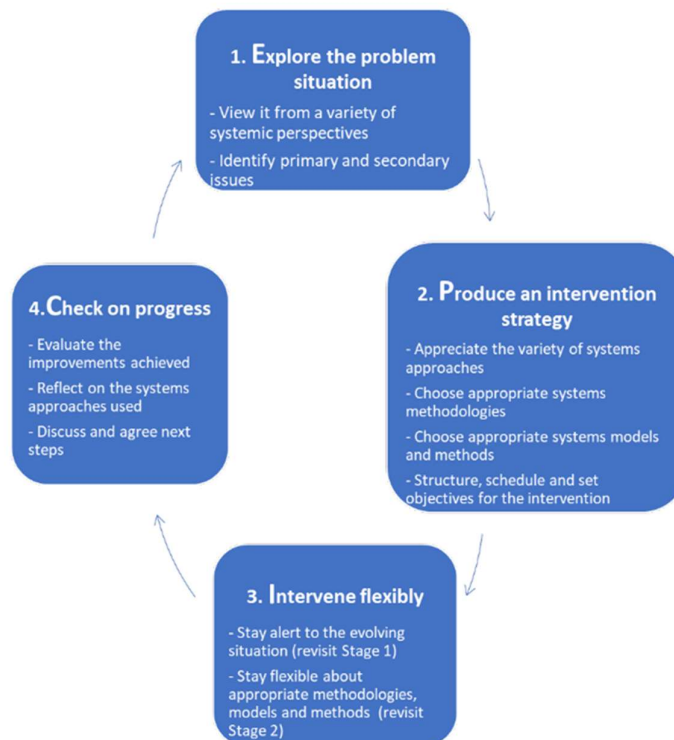


Figure 1 – The 4 stages of critical systems practice (Jackson, 2020,p16)

The initial stage of the EPIC model identifies 6 distinct ways in which complexity could manifest within an organisation and corresponding established systems approaches that could be of benefit in any future improvement action as summarised in figure 2. To identify the 'complexity types' the 'system' is analysed using a 'systemic perspectives' which are conceptual metaphors that align with particular systems paradigms (machine, organism, cultural/political, societal/environmental, and interrelationships)(Jackson, 2020a). Once an assessment of the complexity types is complete, a process of prioritisation is then undertaken to identify primary issues that should be addressed and secondary issues that may need to be considered later in the analysis.

Complexity type		Recommended established systems methodology
A	Technical	Hard systems thinking Operational Research Systems Analysis Systems Engineering
B	Process	The vanguard method
C	Structural	Systems Dynamics
D	Organisational	Socio-technical systems thinking Organisational cybernetics and the viable system model
E	People	Strategic assumption surfacing and testing Interactive planning Soft systems methodology
F	Coercive	Team synteegrity Critical systems heuristics

Figure 2 – Complexity types and recommended systems approaches (adapted from Jackson, 2019)

In undertaking a review of the literature there were no examples identified of Critical Systems Practice being applied in a complex project delivery context. There was also no further information identified relating to the application of the 'systemic perspectives' as a means of identifying 'complexity types'. This highlights a number of gaps in the knowledge with regard to the practical application of Critical Systems Practice as a tool to support complex project delivery and a number of questions currently remain unanswered including:

- How is a Critical Systems Practice diagnosis different from current, established complexity assessments that are available?
- How exactly are systemic perspectives used in the analysis and is special knowledge required to understand the analysis?
- Once diagnosis has occurred how exactly does this enable the selection and prioritisation of systems methods as part of a systemic intervention process?
- What skills are required to undertake the diagnosis and how much effort is required to conclude a full diagnosis, avoiding the trap of oversimplification?
- How sensitive is the analysis to the subjective views of the participants involved in the analysis?

Research Methodology

A detailed description of the research methodology was described in a previous British Academy of Management conference paper (reference omitted to avoid identifying information). In summary, the research is based on three action research cycles. The initial cycle was focused on understanding how project practitioners experience complexity and the ways in which they conceptualise the uncertainty inherent in complex environments. Data was collected through three primary collection methods. Firstly, project practitioners recruited to the study were interviewed in order to understand their perspective on how complexity impacts project delivery and to gauge any prior experience with systems thinking methodologies. This was followed up with a group workshop during which the different perceptions of complexity amongst the participants were explored through use of metaphor. There was then a period of reflective journaling during which the participants were asked to reflect on how complexity manifested during their day-to-day work and a close-out interview to gather feedback from the participants on their experiences of participating in the research. The findings from the initial cycle were then used to inform the second action research cycle.

Preliminary findings

Participation

15 subjects were invited to participate in the initial cycle which resulted in 6 people agreeing to participate and 5 completing the entire cycle. It was found that a major factor adversely impacting the rate of participation was the constraints imposed by the ethics approval. A concern had been raised by the ethics committee that as the research was being sponsored by the employing organisation, participants may feel coerced into participating or unable to fully contribute for fear of retribution. Consequently, participants could not be invited to participate directly by members of the employing organisation. It was however identified during the initial interviews that within this particular organisation, endorsement from the employer was a critical factor in participants agreeing to participate in the research. It was therefore identified that for the second research cycle an 'industrial supervisor' would be appointed who would support this interface between the research team and the organisation.

Reflective journaling

Prior to commencing the cycle it was identified that there are many different approaches to personal reflection and that different personality types have different preferences. Participants were therefore not provided with a specific format for the journalling. Instead, they were encouraged to identify their own preferred approach. Feedback during the closeout interviews found that whilst participants found the reflective process beneficial, they would have preferred clear guidance on the required format of the journal as they were concerned that they were not providing suitable data. Recent studies on the application of the 'diary method' (Unterhitzberger & Lawrence, 2022) identify several practical factors to consider when collecting reflective insights and describe the use of a 'diary instruction sheet' describing how to complete an entry. It has therefore been identified that a standardised reflective journal will be issued in the second cycle with specific guidance on how to complete a journal entry. Participants will also be asked to submit an initial journal entry to ensure they understood the process and address any concerns or queries.

An unexpected benefit realised from the reflective journaling activity was the increased mental wellbeing reported by participants. Feedback during the close out interviews identified that participants found the process of reflecting on the challenges of their work 'therapeutic' and several of the participants stated they would continue to maintain a journal even after the end of the research as a means of coping with the stresses of managing complex projects.

Understanding of systems thinking

All participants were senior practitioners with more than 15 years' experience in complex project delivery and each described scepticism around the introduction of new methodologies as they associated it with previous negative experiences with business improvement initiatives delivered by consultants. By identifying this issue during the initial cycle it has prompted a further literature review focused on understanding the perceptions project teams may have regarding business improvements and how to adapt subsequent research cycles to ensure the participants feel able to participate in the research as co-researchers. Parcell and Collison (2009), for example provide a detailed exploration of how the use of consultants within large project-based organisations has been detrimental to the long term success of the organisations and offers practical guidance on how to engage directly with employees to generate improvements.

Conceptual metaphors

It was identified during the initial interviews that participants had limited understanding of systems theory and systems thinking tools. As a result it was identified that the use of systems based language and terminology could be detrimental to the engagement of the participants. The introduction of the Critical Systems Practice methodology was therefore limited to the use of metaphor as a tool to conceptualise project complexity and explore how there may be multiple perspectives on what project complexity is and how it should be addressed. It was identified that recruiting participants with some knowledge of systems theory in the second cycle may increase engagement with the system perspective metaphors.

Analysis of the data collected from the initial cycle has also highlighted that the use of metaphor as a means of conceptualising and making sense of project complexity appears to not only be common practice but also unconscious in nature. This has prompted further literature review into the application of conceptual metaphor theory within project delivery environments. It has been identified that the use of metaphors is common practice not only for make sense of past events (Alderman & Ivory, 2007; Bröchner, 2022; Drummond & Hodgson, 2003; Viganò, 2020) but there are also examples of using metaphor independently of a systems thinking methodology as a means of adapting the behaviour of teams (Öztel & Hinz, 2001; W. Shelley & Maqsood, 2014).

This raises a question around the appropriateness of the 6 system perspectives championed by Critical Systems Practice and whether limiting the analysis to 6 specific metaphors may in itself be a simplification of the situation. It also raises a more fundamental question around the application of systems theories within project delivery and whether the belief that a project is a system and therefore analysable is in itself a metaphor. It is with this in mind that the second research cycle will aim to explore the possibility of utilising metaphor

independently of Critical Systems Practice and systems theory as a means of understanding project complexity.

Discussion

The fundamental aim of this research is to aid with the management of complex projects. The selection of Critical Systems Practice as a methodology was a result of the identified limitations of any singular systems thinking approach, however the research methodology was designed to allow the research to evolve as data was collected and a greater understanding of project complexity achieved. Following the assessment of the preliminary findings from the first research cycle it has been identified that a number of adaptations will be made in the second research cycle with the possible shift of focus from Critical Systems Practice towards conceptual metaphors.

Whilst it is clear that adopting a more systemic mindset in the attempt to understand project complexity in a more holistic capacity is a worthy pursuit, that could have far reaching benefits for the field of project studies and beyond, there is still much work required to develop a methodology that in itself is not overly complex for practitioners to understand and utilise, and is not unconsciously limited by our own world views.

The research has also identified that the delivery of complex projects often focuses on the tools and techniques required to understand the interdependencies and cope with uncertainties. There appears to be less focus on the individual experiences and mental wellbeing of the people who are delivering the projects. It is possible that this is due to a dominance of metaphors that focus on control and predictability such as a project as a machine and a project as a system which align with the increased application of digital technology. This suggests that the use of alternative metaphors, focused more on the organic delivery of projects such as a project as a living organism or a societal construct, offers the potential to rebalance the focus by prompting greater analysis of the human experiences that ultimately are responsible for delivering complex projects.

Development of the paper prior to the conference

This paper describes the preliminary findings from the first of three action research cycles. At the time of submitting this paper, the research is partway through the second action research cycle. By the conference, in September 2023, the third cycle will be approaching completion which will enable the paper to report on the preliminary findings of this research. It will use this experience to pose a series of questions on the theoretical stance of the research, its methodology and the light it throws on the empirical use of Critical Systems Practice to deal with project complexity.

References

- Adams, K. M., & Hester, P. T. (2012). Errors in systems approaches. *International Journal of Systems of Systems Engineering*, 3, 233–242.
- Alderman, N., & Ivory, C. (2007). Partnering in major contracts: Paradox and metaphor. *International Journal of Project Management*, 25(4), 386–393. <https://doi.org/10.1016/j.ijproman.2007.01.002>
- Bröchner, J. (2022). Project tragedies. *International Journal of Project Management*, 40(5), 467–470. <https://doi.org/10.1016/j.ijproman.2022.04.001>

- Crudgington, A. (2020). A systems approach to infrastructure delivery. In *Ice*.
https://www.ice.org.uk/getattachment/knowledge-and-resources/briefing-sheet/a-systems-approach-to-infrastructure-delivery/ICE_Systems_Report_final.pdf.aspx
- Daniel, E., & Daniel, P. A. (2019). Megaprojects as complex adaptive systems: The Hinkley point C case. *International Journal of Project Management*, 37(8), 1017–1033.
<https://doi.org/10.1016/j.ijproman.2019.05.001>
- Drummond, H., & Hodgson, J. (2003). The chimpanzees' tea party: A new metaphor for project managers. *Journal of Information Technology*, 18(3), 151–158.
<https://doi.org/10.1080/0268396032000122123>
- Emes, Michael, & Griffiths, W. (2018). Systems thinking: How is it used in project management? *Research Fund Series of Association for Project Management*, April, 1–44.
- Flood, R. L., & Jackson, M. C. (1991). Total systems intervention: A practical face to critical systems thinking. *Systems Practice*, 4(3), 197–213.
- Gonçalves, D. P. (2019). Systems Thinkers: Check Your Scotomas and Watch Your Language! *Cybernetics and Systems*, 50(7), 609–628.
<https://doi.org/10.1080/01969722.2019.1646016>
- Hester, P. T., & Adams, K. M. (2014). *Systemic thinking: Fundamentals for understanding problems and messes* (A. V. Gheorghe (Ed.)). Springer.
<http://systemicthinking.com/origins.html>
- Jackson, M. C. (2019). *Critical Systems Thinking and the Management of Complexity* (1st ed.). Wiley.
- Jackson, M. C. (2020a). Critical systems practice 1: Explore—Starting a multimethodological intervention. *Systems Research and Behavioral Science*, 37(5), 839–858.
- Jackson, M. C. (2020b). Critical systems thinking and practice: what has been done and what needs doing. *Systemist*, 41(1), 31–61. <https://doi.org/10.1001/jama.293.9.1056>
- Jackson, M. C. (2020c). How we understand “complexity” makes a difference: lessons from critical systems thinking and the covid-19 pandemic in the UK. *Systems*, 8(4), 1–12.
<https://doi.org/10.3390/systems8040052>
- Klein, L. (2016). Towards a Practice of Systemic Change — Acknowledging Social Complexity in Project Management. *Systems Research and Behavioral Science*, 33(5), 651–661. <https://doi.org/10.1002/sres.2428>
- Locatelli, G., Mancini, M., & Romano, E. (2014). Systems Engineering to improve the governance in complex project environments. *International Journal of Project Management*, 32(8), 1395–1410. <https://doi.org/10.1016/j.ijproman.2013.10.007>
- Öztel, H., & Hinz, O. (2001). Changing organisations with metaphors. *The Learning Organization*, 8(4), 153–168. <https://doi.org/10.1108/09696470110397602>
- Parcell, G., & Collison, C. (2009). *No More Consultants: We Know More Than We Think* (1st ed.). John Wiley & Sons.
- Pérez, P. Y. P., Pérez, R. E. B., & Kacprzyk, J. (Eds.). (2022). *Artificial Intelligence in Project Management and Making Decisions* (1st ed.). Springer Cham.

<https://doi.org/https://doi.org/10.1007/978-3-030-97269-1>

- Reynolds, M., & Holwell, S. (Eds.). (2010). *Systems Approaches to Managing Change: A Practical Guide* (1st ed.). Springer. <https://doi.org/10.1007/978-1-84882-809-4>
- The DECA: Understanding challenges in delivering project objectives. (2013). In *National Audit Office* (Issue November, p. 42). NAO. https://www.nao.org.uk/wp-content/uploads/2013/10/10251-001-DECA-Guidance_web-final.pdf
- Turner, R. J., Huemann, M., Anbari, F. T., & Bredillet, C. N. (2010). *Perspectives on Projects* (1st ed.). Taylor & Francis Group.
- Unterhitzenberger, C., & Lawrence, K. (2022). Diary method in project studies. *Project Leadership and Society*, 3(June), 100054. <https://doi.org/10.1016/j.plas.2022.100054>
- Viganò, P. (2020). Palimpsest metaphor: Figures and spaces of the contemporary project. *Urban Planning*, 5(2), 167–171. <https://doi.org/10.17645/up.v5i2.3251>
- W. Shelley, A., & Maqsood, T. (2014). Metaphor as a means to constructively influence behavioural interactions in project teams. *International Journal of Managing Projects in Business*, 7(4), 752–766. <https://doi.org/10.1108/IJMPB-02-2014-0018>
- Walker, D., & Lloyd-Walker, B. (2019). The future of the management of projects in the 2030s. *International Journal of Managing Projects in Business*, 12(2), 242–266. <https://doi.org/10.1108/IJMPB-02-2018-0034>
- Yeo, K. T. (1993). Systems thinking and project management - time to reunite. *International Journal of Project Management*, 11(2), 111–117. [https://doi.org/10.1016/0263-7863\(93\)90019-J](https://doi.org/10.1016/0263-7863(93)90019-J)