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Can complex adaptive systems help the wicked problem that is project management?
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by Dr. Michael Pace

Can complex adaptive systems help the wicked problem that is project management? [1, 2]

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ABSTRACT

Wicked problems are among the most challenging and complex issues faced. They are often defined by the complexity, by the presence of contradictory information or knowledge, the network of opinions and stakeholders involved, and the interconnected, often interdisciplinary, nature of the problem. Project management (PM) is the set of practices, procedures, and tools used to organize work and deliver unique results through group activities, within a specific time frame. The benefits of project management have been well documented over the past several decades; yet, the reality of project management maturity and adoption is that not every organization deploys PM practices and those that do so in an immature way. In fact, organizations continue to question the relevance and need for project management despite the empirical evidence of its effectiveness. In the context of a wicked problem, no two projects (or project environments) are the same, and the solution (often a project management methodology) deployed in one setting rarely is successful unilaterally. The resulting occurrence is what is currently seen – consistent project success remains just out of reach. Using the perspective of complex adaptive systems (CAS) may provide a useful lens to bridge the dichotomy between project management benefit and project management methodology. At the base layer, CAS consist of agents who interact and learn from each and from the environment. These interactions are nonlinear. The interactions and evolutions, however, can generate emerging behaviors that are less non-linear (though still unpredictable). To illustrate this concept within project management, a case study of two project organizations within a decentralized setting is presented. The findings of inconsistent success within each organization, despite consistent methods deployed, support the assertion that project management as a complex adaptive system should be treated as a wicked problem

Keywords: Complex Adaptive Systems; PM Methodology; Project Management; VUCA

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INTRODUCTION

A continuing conundrum persists regarding project management success. Longitudinal analysis of projects that succeed, fail, or are considering challenged reveals decades of stagnation in spite of repeated attempts at improvement. Even the tag of "challenged" carries a weight, as those involved in projects prefer not to admit failure but recognize the lack of success. A new perspective on project management approaches is therefore warranted.

The intersection of complexity theory and wicked problems may provide one such avenue. Projects exist in VUCA-environments – volatile, uncertain, complex, ambiguous.   The initiatives themselves are complex, difficult to predict, and lacking linearity. Rationalistic attempts at resolution are met with futility (e.g. wicked problems). Complex adaptive systems and wicked problems seem to synergistic suggest customization is required beyond contemporary project management approaches.

As illustration of this point, a case study is presented of a large, decentralized organization. A cross-section of two organizations, each with a successful and a failed project, are discussed. Rationalistic thinking would suggest success is repeatable within an organization charged with similar projects. The present case study challenges this perspective, as success remains inconsistent.

RELATED WORK

Projects are managing increasingly in environments defined by volatility, uncertainty, complexity, and ambiguity (Ben Mahmoud-Jouini, Midler, & Silberzahn, 2016). Correspondingly, conventional approaches to project management which do not keep this new normal into account present unnecessary challenge to project managers. Bridging research on wicked problems, complexity theory, and project management methods may provide insight into future directions for the field of project management.

Wicked Problems

Wicked problems were first described by Churchman (1967) and built upon by Rittel and Webber (1973). These types of problems are defined by the trouble in defining them, by the lack of a complete or final solution, and by an inherent diabolical resistance to resolution (Burman, Aphane & Mollel (2017). Wicked problems should be treated as if every resolution is the only resolution, as it is possible the attempt to resolve changes or evolves the problem further (Oehmen, Thuesen, Parraguez, & Geraldi, 2015).

Appropriate to project management, wicked problems are extremely complex and conventional models of cause and effect (or even standardization and routine) cease to work (McMillan & Overall, 2016). Wicked problems defy linear decision making and classical flow of information (McMillan & Overall, 2016). Oehmen, Thuesen, Parraguez, and Geraldi (2015) explicitly link projects and wicked problems with the example of user requirement articulation. As proponents of agile methods continually assert, it can be difficult to describe a clear solution; prototyping and potentially shippable product increments are intended to help the customer determine

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requirements throughout the project (instead of during an up-front planning process). Equally problematic to prototyping and continuous delivery can be reductionist attempts, such as "KISS" – keep it simple, stupid (Oehmen et al., 2015).
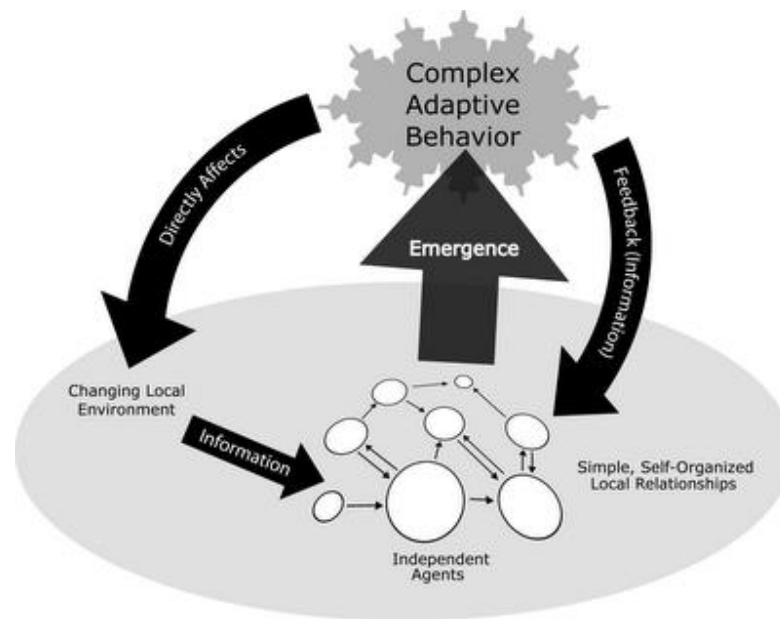
Complexity and Complex Adaptive Systems

Snowden (1999) introduced the cynefin framework (Figure 1) to make sense of the complexity landscape. There are 5 domains within this framework: simple, complicated, complex, chaotic, and disorder. Simple (also called obvious) includes singular agent cause and effect (one causes leads to one effect). The domains evolve from there. Complicated may have a single cause with multiple effects, or multiple causes to a single effect. In the Complex domain, a strict cause and effect relationship cannot be established. In the Chaotic domain, the agents or elements are unrelated. The fifth and final domain, Disorder, is marked by the characteristic of inability to recognize if this domain is applicable.
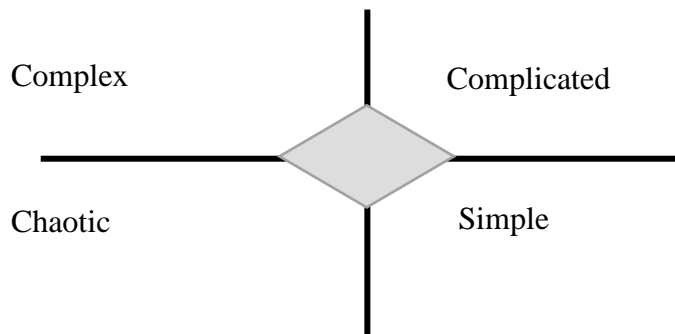
Figure 1: Cynefin Framework. Adapted from Snowden (1999).

Snowden's (1999) original assertion was that with knowledge organizations move through the domains in a clockwise fashion, in that chaotic can lead to complexity to complicated to simple as knowledge, information, intelligence increase.

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Figure 2. A general overview of complex adaptive systems. From Graham, J. (2013). Complex Adaptive Systems. Retrieved from http://creativecommons.org/licenses/by-sa/3.0. Used under Creative Commons Attribution 2.0 Generic.

Projects may exist within any of these domains. A paradigm that may help the clockwise drift between domains is Complex Adaptive Systems. These systems are comprised of agents that interact with each other and with the local environment. The interactions may lead to learning and evolution. Through learning and evolution, adaptive behavior may emerge.

A colloquial explanation of these concepts utilized in the classroom setting involves traffic. In this example, a vehicle is an agent. A car is complicated, yet predictable. The engine compartment may seem chaotic to the layman, but an experienced professional is familiar with the causal relationships between the elements of the engine. Placing that vehicle onto the roadway creates complexity. Multiple vehicles all traveling together on the same road creates a Complex Adaptive System. It is difficult if not impossible to predict what any one vehicle may do, but a great deal of information becomes evident. Should the collection of vehicles see a police officer, the traffic will all slow down. Should an accident occur, the traffic will stop and detour routes start to congest.

Project Management Methodologies

Project management, regardless of method, emphasizes standardization and routine (Ben Mahmoud-Juini et al, 2016). A rationalistic viewpoint persists, despite criticism from scholars and practitioners (Svejvig & Andersen, 2014; Morris et al., 2011).

There are two main categories of project management methodologies: plan driven and change driven (Table 1). Each of these categories contains multiple specific methods. The plan driven approaches focus on developing and maintaining a predictable plan, sometimes despite changing environment, context, or goals (Ben Mahmoud-Juini et al, 2016; Shenhar & Dvir, 2007). Change driven methods originated in the early 2000s with the Agile Manifesto and focus on collaboration while embracing change.

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Table 1: Plan and Change Driven Methods

Plan Driven Methods	Change Driven Methods
Waterfall	Scrum
Critical Path Method	XP (extreme programming)
Critical Chain Method	Lean
PRINCE2	Kanban
SPIRAL	Six Sigma
CAP GEMINI SDM	Scaled Agile Framework (SAFe)

A challenge of classifying project methodologies includes lack of knowledge of the options available. Anecdotally, project managers – especially those new to the profession – know of waterfall or PMBOK but not what these methods actually entail. Conversely, professionals may want to be agile, but not understand what that means. Plan driven and change driven methods can be seen as divergent ends of several spectra (Figure 2). Plan driven methods have large amounts of documentation, whereas change driven methods do not. Comparatively, change driven methods have higher bureaucratic process control (e.g. the routine of scrum compared to a waterfall project). Additionally, the proponents of change driven methods embrace lack of goal clarity; plan driven methods attempt to define goals early in the process and avoid or prevent changes.
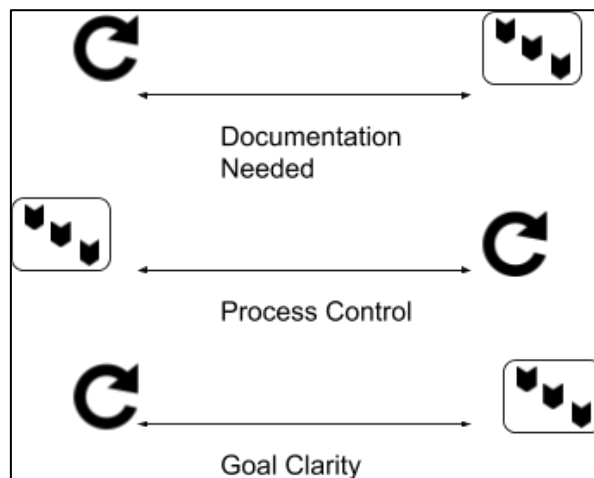
Figure 3: Spectra for Method Classification (Change Driven vs Plan Driven). Source: Author

2 ORGANIZATIONS, 4 PROJECTS

Presented here are a subset of examples from a real organization. Identifying information has been omitted to protect anonymity. The organization in question is a large public, for-profit company within a technology-related industry. The organization is organized via traditional management hierarchy (CEO, COO, CFO) across multiple functional areas (SVP).

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Organization 1

The project management function of the marketing division of the company is of a level 2 maturity, with a standard and common process for project management. The team is well established, with most employees having a tenure of over 2 years and a project portfolio averaging 75 – 80 active initiatives.

One such initiative involved a marketing promotion geared toward attracting new customers. The project sponsor worked with the project manager to identify the project scope and schedule. The sponsor was familiar with projects, but not an expert; the project manager was PMP® certified with over 10 years of experience. Formal documentation was created based on a plan-driven methodology, and formal roles and responsibilities were established for the project team. A schedule was created based upon the critical path method, with time buffer added to the end of the project based on critical chain. The end result of the project was measured a success based upon completion of all project activities on schedule, on budget, and on scope. The results of the project, attraction of new customers, were not measured for benefits realization due.

Another initiative within the same department was chartered to redesign the customer-facing website. As with the previously mentioned project, the project sponsor and project manager worked together to identify project scope and establish a project schedule. This was the same project manager, but different project sponsor, as the previous project. This sponsor was familiar with project management and specifically asked for an agile approach. The project manager was familiar with agile, though not certified in that methodology.   Formal documentation was created based on an iterative approach, including a product backlog. The team was setup based on the Scrum method, with small teams meeting daily and small sprints requested. The overall schedule was not created (e.g. release train). The end result of this project was failure. The project ran over budget, over schedule, and scope was in constant flux. The results of the project, a redesigned website, were also a failure. The website was not allowed into production due to feedback from the management hierarchy of CEO, COO, CFO, CIO.

There are similarities and differences between the projects. The same project manager and team was involved in both projects, though a different sponsor. A formal process was established for both, though it was a different method for each. Markedly, the results were very different.

Organization 2

Within the same organization, the product management department maintains a separate project management function. This PMO is also a level 2 maturity (as defined previously), has the same average employee tenure, employee skill sets, and average project portfolio.

A project was chartered to implement a commercially available project portfolio management (PPM) tool. A formal requirements document was created in advance of started a Request for Proposal (RFP) process. Objective criteria determined the optimal vendor for implementation. The implementation phase of the project was explicitly scoped, the project manager and project sponsor established schedule milestones to be hit, and clear goal of the project – success implementation – was documented. An incremental waterfall method was utilized by the project manager (who was experienced, certified, educated in project management). Sub-teams were

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onboarded into the PPM tool in batches, building to the entire department using the same tool. The project never finished, as scope creep as well as poor customer acceptance led to failure to adopt the tool. Budget was fixed based upon contract rates, so financial overrun was not experienced, but additional (unexpected) resources were added to the project in attempts to stay on budget.

Due to the failure of this previous project, the project was re-initialized with a new project manager. All other details remained the same, including sponsor, methodology, vendor, requirements, and schedule milestones. The results of this new attempted implementation were measured a success that delivered ahead of schedule, on budget, and on scope. Benefits realization was tracked based upon user adoption, which exceeded all estimates.

DISCUSSION

A wicked problem defies traditional resolution. The same solution cannot be deployed routinely. The above exemplifies this definition. The same organization deploying the same solution routinely may have inconsistent project success rates. This finding may be the results of the interactions of project stakeholders (agents of the Complex Adaptive System), the project environment, including organization maturity, project approach, and initiative goals, and the learning that occurs throughout the course of the project.

The question generated from 4 projects listed above is: which combination of events, processes, and artifacts created synergy and success and which combination led to confounded failure? Based on Complex Adaptive Systems, there is no answer. Each project is unique and the learning, interaction, and evolution between agents (project team members) and environment is impossible to predict. A single factor (or even set of factors) cannot be determined as most critical. This aligns with wicked problems, as the same resolution cannot be used on similar problem.

A key recommendation becomes the customization of each project approach based upon critical analysis of the environment, agents, and interactions, while also expected adaptation and evolution to occur over time. Authors (Loch, De Meyer, & Pich, 2006; Shenhar & Dvir, 2007; Pace, 2019) have pointed out, a one-size-fits-all approach is inappropriate, and customization should be undertaken. The emergent behavior exhibited by projects must be considered. A singular, standardized approach is inappropriate for most project management circumstances. Instead, the methodology selected should match the project approach and project goals and fit within the project environment. How project stakeholders are managed throughout the course of the initiative, be it via status meetings, daily scrums, or some middle context, should also match the needs and approach.

CONCLUSIONS

Project management is deployed in attempts to organize chaos, drive efficiency, and increase the probability of initiative success. Utilization of project management practices or principles, irrespective of specific elements or methods, has been shown to provide value – especially in comparison to no standardized approach. Increased maturity can also lead to increased benefit. Despite this, project success rates have been stagnant for decades. A potential contributor to this phenomenon is a simplistic notion that the uniqueness of projects, inclusive of finitude,

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complexity, and normativity, correspondingly create wicked problems. Wicked problems cannot be solved through the application of standardized rules or procedures. This materializes with challenged projects despite formal and repeatable process, expert and experienced project managers, and mature organizations. The Complex Adaptive Systems elements of self-organized agents, learning, and emerging behavior may point towards a mitigating strategy. Treating each project as new and novel, including modifying and customizing methodology selection, may help alleviate the challenge.

REFERENCES

Ben Mahmoud-Jouini, S., Midler, C., & Silberzahn, P. (2016). Contributions of design thinking to project management in an innovation context. Project Management Journal, 47(2), 144-156.

Budzier, A. and Flyvbjerg, B. (2013). Making sense of the impact and importance of outliers in project management through the use of power laws. Paper presented at International Research Network on Organizing by Projects, 11th. Retrieved from http://eureka.sbs.ox.ac.uk/4745/1/Budzier_and_Flyvbj erg.pdf

Burman, C. J., Aphane, M. A., & Mollel, N. M. (2017). The Taming Wicked Problems Framework: Reflections in the making. Journal for New Generation Sciences, 15(1), 51-73.

Cross, N. (1982). Designerly ways of knowing. Design studies, 3(4), 221-227.

Farrell, R., & Hooker, C. (2013). Design, science and wicked problems. Design Studies, 34(6), 681-705.

Loch, C. H., DeMeyer, A., & Pich, M. (2011). Managing the unknown: A new approach to managing high uncertainty and risk in projects. John Wiley & Sons.

McMillan, C., & Overall, J. (2016). Wicked problems: turning strategic management upside down. Journal of Business Strategy, 37(1), 34-43.

Morris, P. W., Pinto, J., & Söderlund, J. (2011). Introduction: towards the third wave of project management. In The Oxford handbook of project management. Oxford University Press.

Oehmen, J., Thuesen, C., Parraguez, P., & Geraldi, J. (2015). Complexity management for projects, programmes, and portfolios: an engineering systems perspective.

Pace, M. (2019). A Correlational Study on Project Management Methodology and Project Success. Journal of Engineering, Project, and Production Management.

Serrador, P. and Pinto, J. K. (2015). Does Agile work? - A quantitative analysis of agile project success. International Journal of Project Management, 33(5), 1040-1051. doi:10.1016/ j.ijproman.2015.01.006

Serrador, P. and Turner, R. (2015). The relationship between project success and project efficiency.

Shenhar, A. J., & Dvir, D. (2007). Reinventing project management: the diamond approach to successful growth and innovation. Harvard Business Review Press.

Snowden, D. (1999). Liberating knowledge. *Liberating Knowledge CBI Business Guide*, 9-19.

Suetin, S., Vikhodtseva, E., Nikitin, S., Lyalin, A., and Brikoshina, I. (2016). Results of agile project management implementation in software engineering companies. ITM Web Of Conferences, 6, P 03016 (2016), 03016. doi:10.1051/itmconf/20160603016

Svejvig, P., & Andersen, P. (2015). Rethinking project management: A structured literature review with a critical look at the brave new world. International Journal of Project Management, 33(2), 278-290.

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Dr. Michael Pace currently serves Texas A&M University as Executive Professor within Mays Department of Management. As a practitioner, Dr. Pace has held various positions related to project, program and portfolio management across a broad variety of organizations and industries. Dr. Pace received his doctorate from Capella University in Business Management with a specialization in Project Management, Master's degree from Sam Houston State in Forensic Science, and Bachelor's degree from Baylor University in Forensic Science. In addition to his Mays appointment, he serves in adjunct roles with Texas A&M Corpus Christi, Texas A&M Energy Institute, and Texas A&M Engineering.

Dr. Pace's research is focused on project management methodologies, especially the customization of a method to fit the project need. He teaches courses in project management, strategic management, and organizational behavior. He can be contacted at wpace@mays.tamu.edu