

AHP/ANP: The Next Generation

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SELECTION OF APPROPRIATE PROJECT MANAGEMENT METHODOLOGIES FOR EMERGENCY PROJECTS USING ANALYTIC HIERARCHY PROCESS



YORKVILLE
UNIVERSITY

Track 7: Risk Analysis and Disaster Management



Chris Tabi Amponsah, PhD., Peng.

Tamara Opokua Amponsah, MS3

Presentation Outline

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3. Problem/Question
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- The frequency at which catastrophes and man-made disasters occur at global levels is alarming. The United Nations Disaster Risk Reduction (UNDRR-2020) reports that in the period between 2000 to 2019, there have been as many as 7,348 major disaster events claiming 1.23 million lives, affecting 4.2 billion people (many on more than one occasion) resulting in approximately US\$2.97 trillion in global economic losses.
- The COVID-19 pandemic alone, as of October 2020, has claimed over 1.2 million lives (Johns Hopkins University- <https://coronavirus.jhu.edu/>) with trillions of financial impacts on the global economy.
- Disasters as referred in this paper include natural disasters like tsunami, hurricanes, earthquake, and man-made disasters ranging from planned terrorist attack, bush fires, power outages, chemical threat, biological threat, nuclear accidents, wars, explosion oil & chemical spills, dam failure and of late the coronavirus pandemic.

Motivation for Research

- When disasters occur, responses involve a myriad of agencies, from government agencies at local, state, and federal level, to non-governmental and non-profit organizations, such as the Red Cross, as well as commercial entities contracted for the purpose of providing relief to help the deprived.
- Most emergency response efforts go into developing and repairing infrastructure projects to mitigate the effect of the emergencies.
- In all instances, a coordinated effort is pivotal in identifying and prioritizing areas of dispossessions.

Motivation for Research

- It requires a whole life cycle of emergency management to identify areas of weaknesses. The major phases of the emergencies include prevention, preparedness, response, recovery, and mitigation. The role of government agencies at local, state, and federal levels in each phase needs to be analyzed.
- By its nature of occurrence most often the action plan to mitigate emergencies are not coordinated well, or at best in a haphazard manner.

Motivation for Research

- Using appropriate project management methodologies and management can potentially improve the delivery of such projects along the project life cycle.
- According to PMBOK (2017), project management is the application of knowledge, skills, tools, and techniques to project activities in order to meet project requirements. Project management is accomplished through initiating, defining, executing, monitoring, control and closing. Along the project life cycle, there are several/best practices of project management methodologies that can be utilized to successfully achieve the project objectives. The most popular ones are; Agile, Scrum, Kanban, Scrumban, Lean, eXtreme Programming (XP), Waterfall, PRINCE2 and PMI's PMBOK.

Problems/Research Question

- As to which type of project management methodology is suitable for emergency situations, there is no known research that has laid out such a methodology.
- Further, to many project managers, emergency situations are the least anticipated, resulting in a world of optimism until the unexpected happens. Then out of haste in an emergency situation, project managers rush to execute projects with whatever they have on hand.
 - *The question therefore is, what project management methodologies are appropriate for delivery of emergency projects?*

Objectives

- The objective of this study seek to answer the research question and to examine the appropriate project management methodology to be used for implementing projects in case of emergencies.
- Although there are well known and popular project management methodologies used across industries, this study seeks to assess the current project management methodologies used in emergency projects.
- This will help evaluate which elements of methodologies project managers found most essential as an adaptable and acceptable approach to manage projects in emergencies. It also seeks to understand issues and challenges specific to emergency projects and to present potential solutions for management, identify similar issues and challenges and assess how an adaptable methodology would be of impact, and propose a framework which can be applied to projects in case of emergency..

- Several studies have compiled Analytical Hierarchy Process (AHP) success stories in very different fields (Vargas, 1990); (Ho, 2008); (Golden, Wasil, Harker, & Vargas, 1990); (Shim, 1989); (Saaty & Forman, 1992); (Forman & Gass, 2001); (Kumar & Vaidya, 2006); (Omkarprasad, & Sushil, 2006); (Liberatore & Nydick, 2008); (Zahedi, 1986); Amponsah & Adams, 2017).
- The oldest reference dates to 1972 (Saaty, 1972a), after this, (Saaty, 1977b), precisely described the method.
- The AHP technique developed by Thomas L. Saaty is Multi-Criteria Decision Analysis (MCDA) method that helps decision makers make the best decisions in the face of complex problems consisting of multiple conflicts and internal criteria.
- Project methodologies have been developed specifically to help address low success rates using project-related knowledge (The Standish Group, 2010; Wysocki, 2011).

- When used for group decision making, MCDA helps facilitate talks about their decision opportunity (the problem to be solved) in a way that allows them to consider the values of each viewpoint. It also provides a unique ability for people to consider and talk about complex trade-offs among various alternatives.
- In effect, MCDA helps people think, re-think, query, adjust, decide, re-think further, test, adjust, and finally come to a decision. MCDA problems are comprised of five components:
 - *1) Goal, 2) Decision maker or group of decision makers with opinions (preferences), 3) Decision alternatives, 4) Evaluation criteria (interests) 5) Outcomes or consequences associated with alternative/interest combination.*

- The PMI (2017) defines a project as a temporary endeavor undertaken to create a unique product, service or result. By extension, an emergency project is one that is emergent in nature and must be undertaken immediately to prevent or correct structural deficiencies or hazardous conditions that may harm or injure persons involved.
- According to the PMBoK® Guide (PMI 2017, p. 5), PM is defined as ‘the application of knowledge, skills, tools and techniques’ to execute and deliver projects effectively and efficiently.

- This definition is applied to hard or tangible projects: ‘hard issues and measures include time, cost and quality, traditional measures used to establish project success’ (Crawford & Pollack 2004, p. 2).
- Soft projects, on the other hand, mean intangible projects with a concern for the well-being of man and or the environment: ‘community perception, safety, environmental impacts, legal acceptability, political and social impacts ... include benefits, stakeholders, value management, and communications’ (ibid.).

Research Design/Model

- The study uses extant review of literature with the aim of determining the status of research on project management methodologies to identify their appropriateness for emergency work.
- According to Simonovic (2011, p. 20), ‘the nature of disasters and emergencies are changing and becoming more complex’ This is due to the interaction of and changes in several systems, namely the environmental systems causing these changes, the humans and communities who live through these changes and the infrastructure which is affected by these changes.
- Due to the unknown consequences and uncertain impacts of a disaster event, there is a lack of control which puts any preparedness plans under extreme stress or renders them ineffective. Post-disaster projects, especially relief projects, are placed under equally extreme pressures due to the time factor, which is essential to the safety of the people affected.

Research Design/Model

- The Analytic Hierarchy Process (AHP) a decision-aiding method developed by Saaty (1980, 1985 &1990) aims to quantify relative priorities for a given set of alternatives on a ratio scale, based on the judgment of the decision-maker while stressing the importance of the intuitive judgments of a decisionmaker as well as the consistency of the comparison of alternatives in the decision-making process.
- Since a decision-maker bases judgment on knowledge and experience and then makes decisions accordingly, the AHP approach agrees well with the behavior of a decision-maker. The strength of this approach is that it organizes tangible and intangible factors in a systematic way and provides a structured yet relatively simple solution to the decision-making problems (Skibniewski & Chao 1992).
- In addition, by breaking a problem down in a logical fashion from the large, descending in gradual steps to the small, one is able to connect, through simple paired comparison judgments, the small to the large.

By following the AHP outline indicated above, the hierarchy of the problem can be developed for the project methodology as shown in Figure 1. The following can be done manually or automatically by using the Expert Choice software.

1. Synthesizing the pair-wise comparison matrix
2. Calculating the priority vector for a criterion such as technology
3. Calculating the consistency ratio
4. Calculating λ_{\max}
5. Selecting appropriate values of the random consistency ratio from a table, and
6. Checking the consistency of the pair-wise comparison matrix to assess whether the decisionmakers' comparison was consistent or not.

Research Design/Model

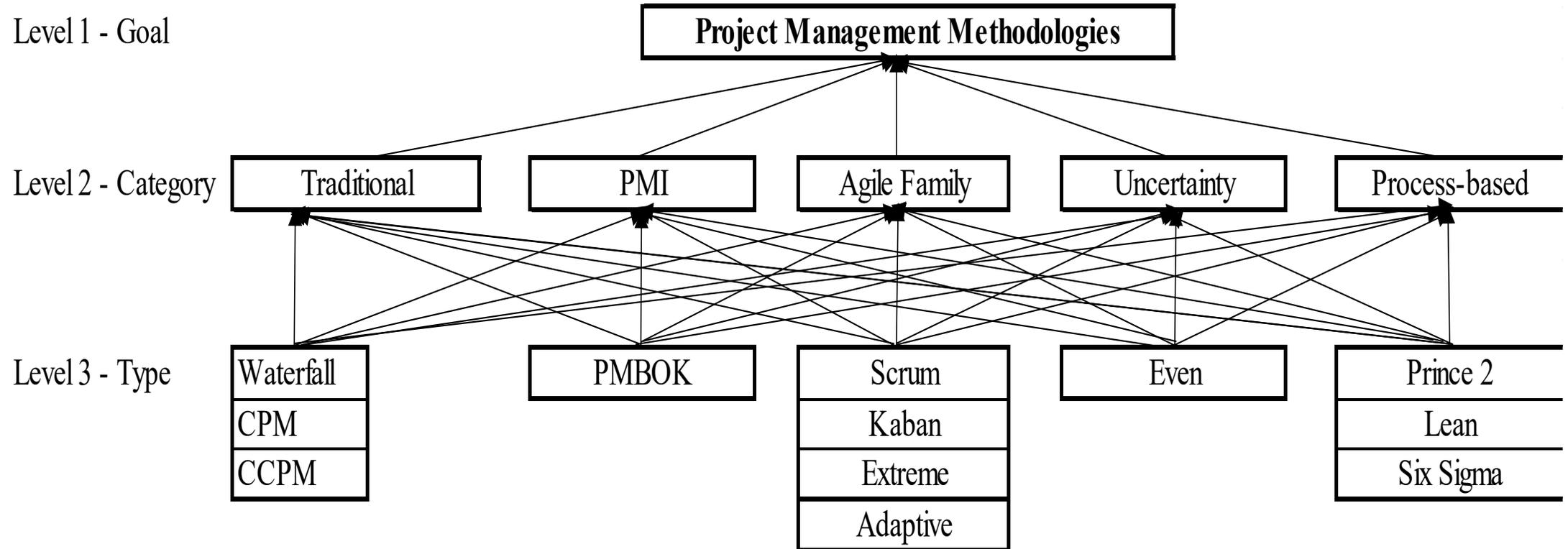


Figure 1: Hierarchy of Project Management Methodologies

Limitations

- The present study is not without its limitations. The choice of search procedure meant total coverage of all the relevant empirical search on project methodology framework was not achieved.
- Papers may therefore have been included that did in fact address the project management methodology, but because of conceptual ambiguity, were not included. Yet, if the era of project management methodology really has started, then this procedure is certainly well justified.
- Finally, this paper proposes some research directions that are not exhaustive but rather represent the initial stages of a new line of inquiry. Further research can also be carried out with a larger sample across more organizations from different industries and regions in order to obtain more validated information that can be analyzed to draw conclusions on the various aspects and determinants of the project management methodology framework.

Conclusions

- The AHP, noted for its flexibility, systematic approach, robustness, and reproducible evaluation, is used to assess how project management methodologies are used along the project life cycle and ranked in preferred order.
- The findings of this study are expected to be useful in improving current project management capability as well as relevant laws and regulations in times of emergency.
- The study concludes that in terms of resources, using appropriate methodology helps shorten the project team's learning curve, improves team focus, reduces distractions caused by teams going off track or budget, empowers teams to deliver results that actually impact the business bottom line and contributes to the company's strategic goals.
- Finally, when the methodology is adapted with focus, it is possible to lower implementation risks and improve project delivery in emergencies.

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