Chapter 19
Complexity Framework for the Project Management Curriculum

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ABSTRACT

Universities' core project management courses address the key principles and best practices of project management methodologies, while elective courses are utilized to introduce alternative project frameworks. The concept of project complexity can be taught to strengthen competency in project managers and enhance the success of the projects they manage. Previous instruction methods were evaluated to determine the key concepts that pertain to project complexity. This article proposes a preliminary framework for the development of an elective course on project complexity.

INTRODUCTION

A key aspect of project success is the competency of the project manager, which is developed through education and on-the-job experience. Universities that offer degrees in project management seek to broaden the learning experience of their students through a variety of project management courses. While a typical core project curriculum introduces the principles of the project management methodology, it is through elective courses that instructors can expose students to alternative variables that impact the success of projects. As a result, an important question for instructors is how to design a challenging course elective in project management to build competencies. This paper attempts to answer this question by proposing a preliminary framework for an elective course on project complexity based on the Project Management Institute's (PMI) Navigating Complexity (2014) practice guide. It provides a set of topics and corresponding studies that can be used to develop project complexity curriculum for project management students. In this paper, an overview of potential learning objectives is proposed followed by

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a review of relevant complexity factors based on the Project Management Institute's (PMI) Navigating Complexity (2014) practice guide. Next, learning outcomes are recommended along with a preliminary framework for developing an elective course on project complexity. This article extends prior research on project complexity (Cleveland, 2017) by expanding the scope of each complexity factor, introducing a set of new factors, and recommending a study plan for integrating a complexity elective course into the project management curriculum.

CONCEPTS AND SOURCES OF COMPLEXITY

Organizational Complexity

According to Cooke-Davies, Cicmil, Crawford and Richardson (2007), complexity theory can be defined as "the study of how order, structure, pattern, and novelty arise form extremely complicated, apparently chaotic systems and conversely, how complex behavior and structure emerges from simple underlying rules." (p. 52). Complexity theory provides an understanding of complex systems and how they are related to organizations. This theory recognizes that there are specific but shared order and behavior among systems, and it rationalizes how separate elements of a system interact with and impact one another (Battram, 1998). An examination of this theory reveals differences between simple and complex systems and allows an organization to determine if they are prepared to handle these complexities.

There are key competencies that organizations must develop to address complexity factors. PMI identified that leadership requires the provision of active executive sponsorship and commitment. It also involves empowering the program and project managers with the support to facilitate successful delivery of results. Leadership involves awareness of early warning signs of problems and the enactment of action plans to address potential dangers. Portfolio management is a critical driver for navigating complexity. It requires organizations to elevate portfolio management practices to a strategic level to understand and support the portfolio management practice. It also requires the establishment of a portfolio minded culture where senior management should demonstrate support for the portfolio management by communicating effectively and investing in dedicated resources and proper training. Finally, senior management must leverage formal portfolio tools and practices to standardize the portfolio management practices.

Project Complexity

Project complexity can be divided into three distinct types: assembly project complexity, system project complexity, and array project complexity. Assembly project complexity involves a component or device within a larger system that performs a single function, such as a car engine or LCD projector. Assembly projects are typically handled by smaller but closely integrated teams that rely on frequent communication and limited documentation. System project complexity is related to systems, full platforms, or business units. Such projects are handled by larger teams that are coordinated by central project management offices (PMO) and are characterized by increased formality and bureaucracy. The array project complexity is associated with systems that, while functioning together, are spread out geographically. Projects of this type involve the improvement or addition of components to a variety of systems or structures, such as the modernization of entire cities transit systems or infrastructures. Such projects are managed by an organization with broad scale functions.