Available online at www.sciencedirect.com
ScienceDirect
International Journal of Project Management 27 (2009) 355–364
International Journal of Project Management
www.elsevier.com/locate/ijproman

Project management approaches for dynamic environments

Simon Collyer [a,*], Clive M.J. Warren [b]

[a] School of Geography, Planning and Architecture, The University of Queensland, Australia
[b] UQ Business School, The University of Queensland, Australia

Received 9 July 2007; received in revised form 19 April 2008; accepted 22 April 2008

Abstract

This paper investigates the properties of projects conducted in rapidly changing environments. These projects are challenged by the rapid introduction of new unknowns as they progress. One might say they are more akin to stacking worms than stacking bricks. The difficulties posed by these projects are identified and the literature is reviewed for suitable approaches.

Keywords: Project management; Dynamic

1. Introduction

This paper sets out to investigate the nature of projects conducted in fast changing environments. Examples and theory are used to illustrate the nature and challenges of this category. Suitable management approaches are identified under the following headings: Planning, Experimentation, Lifecycle, Controls, Culture, Communication, and Leadership style.

2. The dynamic project category

The paper closes with recommendations for further research. In this paper, *control* is taken to mean the mechanisms through which resources are managed to achieve objectives [1], and is different to the PMBOK 'technique' [2] which is strictly focused on bringing activities in line with a plan [3]. The term dynamic is taken to mean characterised by constant change [4]. In the project management context dynamism is taken to be a dimension of a project that represents the extent to which a project is influenced by changes in the environment in which it is conducted. This paper argues that this is a non-binary dimension that applies in varying degrees to all projects, so strictly any given project is neither 'dynamic' nor 'not dynamic'. All projects have some degree of dynamism, so the dimension is not dichotomic. Therefore, the ideas in this paper may be applied in varying degrees to any project as deemed appropriate. For the sake of simplicity though, for the remainder of this paper, a dynamic project is taken to be one that is necessarily subject to higher than normal levels of change due to the environment in which it is conducted.

The business environment is changing at an increasing pace [5–7]. Rothwell and Zegveld [8] went so far as to say we are in the midst of a technology explosion. They argued that 90% of our technical knowledge has been generated in the last 55 years, and that technical knowledge will continue to increase exponentially. Perrino and Tipping [9] reported "the pace of technology is accelerating, raising the stakes and risks for managing innovation, and requiring early warning and shorter response time". Change, in all forms of technology and business processes, can be regarded as increasingly pervasive and providing challenges even where high technology is not a core business, such as in mining [10]. Consider how the Australian Submarine project was challenged by developments in the IT industry between the 1980s design phase, and sea trials decades later [7].

This paper will now investigate dynamic projects from a theoretical point of view. Gray and Larson [11] argued that

* Corresponding author. Address: ITS Project Office, The University of Queensland, Brisbane, QLD 4072, Australia. Tel.: +61 7 33654935; fax: +61 401 991111.
E-mail address: scollyer@post.com (S. Collyer).

0263-7863/$36.00 © 2008 Elsevier Ltd and IPMA. All rights reserved.
doi:10.1016/j.ijproman.2008.04.004

projects conducted in highly uncertain environments are a key unresolved project management issue and present the following challenges:

- planning for uncertain outcomes;
- balancing flexibility with reliability and accountability;
- balancing decision quality against decision speed;
- timing scope freeze during rapid change.

Pich, Loch and De Meyer [12] describe a type of project that encounters unknown unknowns and how it is best suited to what they called a 'learning' strategy which involves scanning, problem solving and flexibility. They argue that this is distinct from projects conducted in well understood environments which are suited to 'instructionism', and distinct from 'selectionism' where the most fruitful initiative is chosen after a pool of trials. Turner and Cochran [13] espouse the 'goals and methods matrix' that describes four different types of project according to how well defined the methods and goals are. Projects can have poorly defined goals ('fire') or poorly defined methods ('water'), or both ('air').

Shenhar and Wideman [14] describe a type of project that involves high levels of uncertainty, using technologies together for the first time. They call these 'high tech' [14]. They also describe a type of project that actually creates new technologies, called 'super high tech'. Shenhar [15] describes how 'low technology' projects are typically performed in construction, production and utilities, and high technology projects in the computer, aerospace and electronics industries. He offers building and bridge construction as examples of low technology projects. The key difference to Shenhar is the level of development work involved, in that low technology projects have little, and high technology projects have considerable levels and usually require prototyping. Shenhar and Wideman [14] argue that another key difference is the number of design cycles. In low technology projects they say there is typically only one cycle with a freeze before development, and with high technology there are at least two, typically three cycles.

Cioffi [16] suggests that 'projects' be placed on a spectrum of 'newness' from operational to project. The idea has been adapted in Fig. 1 to illustrate the sliding scale of unknowns that applies to projects. Unknowns in this sense refer to any aspect of the project, including the methods to achieve it, the objective, and the environment it has to operate in.

The guide to the project management body of knowledge (PMBOK) [2] describes 'progressive elaboration', where planning is developed in greater detail as the project progresses. Using progressive elaboration to fill knowledge gaps, it might be possible to move a project to the left in Fig. 1, thereby achieving the objective in a more predictable fashion. However, rapid changes in the environment, including tools and methods, and attempts to innovate, act to push the project to the right, increasing unknowns. The two forces of exploration and change act against each other continuously throughout the project. The challenge is to conduct exploration at a greater rate than the emergence of environmental change. It is also important to ensure that the amount of change created by the exploration and implementation is not counterproductive overall. An example of Project A in Fig. 1 might be a production line where there only variable is the colour required. Project B might be a house construction where there are more unknowns at the start but most are resolved in the early stages. Project C might be a software development project for a new business. The client's business processes, and the technologies used in the project, change during the course of execution, thereby affecting the methods used and goals.

Projects conducted in environments with higher levels of dynamism may be more likely to pose some of the attributes of Shenhar's [15] high technology or super high technology categories with uncertainty at the start, but also include even more challenging high levels of change along the way. In dynamic project environments, significant proportions of the methods and goals are changed by external forces out of the project's control. The effort to resolve unknowns at the start of the project is severely challenged by the introduction of additional unknowns along the way, because what is learned can become obsolete in less time

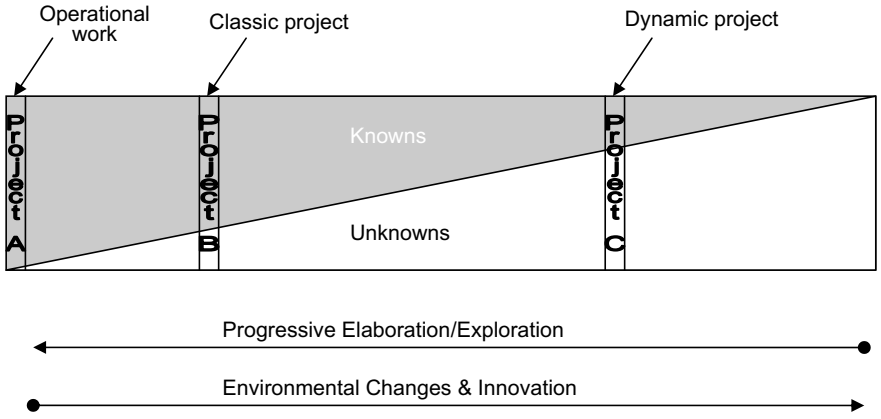

Fig. 1. The race to resolve project unknowns.