The Waterfall Approach and Requirement Uncertainty:
An In-Depth Case Study of an Enterprise Systems Implementation at a Major Airline Company

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ABSTRACT

The Waterfall approach has been the dominant approach for enterprise systems (ES) implementation since the 1970s. It offers ES project managers a simple, step-by-step way to make ES projects manageable and minimize drawbacks. The main criticism of this approach centres on its inflexibility regarding requirement uncertainty. In this article, the authors challenge this criticism. By means of an in-depth case study of a Waterfall approach-based ES implementation project within the maintenance department of one of the world's biggest airline companies, this article will illustrate how it deals with requirements uncertainty and required flexibility in practice.

Keywords: *Agile Approach, Enterprise Systems, In-Depth Case Study, Project Management, Requirements Uncertainty, Waterfall Approach*

INTRODUCTION

Enterprise systems (ES) can be defined as configurable, off-the-shelf software packages that provide an integrated suite of systems and information resources for operational and management processes across a broad range of business activities (Ward et al., 2005). They are intended to support business in the contemporary knowledge-based global economy (De Carvalho & Tanaka, 2008). Enterprise Systems (ES) cover a plethora of subjects that range from Enterprise Resource Planning (ERP), Enterprise Content Management (ECM) and Customer Relationship Management (CRM), to Decision Support Systems and Business Intelligence. It is acknowledged that developing and managing these systems involve dealing with the dynamics of contextual forces (Nandhakumar et al., 2005).

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In their review of the studies of enterprise systems implementation, Shanks et al. (2000), Somers and Nelson (2001), Nah et al. (2001), and Umble et al. (2003) show project management, balanced project team, clear goals and objectives, change management, minimum customization, and project champion to be the main critical success factors. All of them stress the importance of ES project management issues as one of the major success factors, a conclusion widely debated in the academic literature on ES implementation and information systems (IS) implementation (Austin & Devin, 2003; Brown, 2004; Kim & Pan, 2006).

ES projects are notorious for their failure rates (Barker & Frolik, 2003; Mendel, 1999; Umble & Umble, 2002), and the question remains, why is project management of ES implementations more difficult than that of other types of IS projects? Jurison (1999) explains that the difficulty is in the nature of the 'product'. The most frequently cited aspects that make managing software projects more difficult are: intangibility of the 'product', complexity of the 'product', and volatility of the requirements. Or in other words, software is invisible, it is difficult to comprehend, and its requirements are under constant pressure to change, making ES project success hard to achieve.

Many project management methodologies and tools have been developed throughout the years that claim to contribute to ES project success, and the importance of project management is fully acknowledged in the literature (White & Fortune, 2002; Somers & Nelson, 2004). Project management is considered a series of activities associated with carrying out a project as effectively as possible (Jurison, 1999, p. 6). Project management aims to anticipate as many of the dangers and problems as possible and to plan, coordinate, and control the complex and diverse activities of projects to ensure successful completion despite the risks (Lock, 2007). Project management has a long history, but in the modern management literature it was Henry Gantt (1861-1919) who first proposed that an organized approach was needed to manage the complex interrelationships among an enormous number of different tasks performed by many different specialists. He developed the Gantt chart, a way of ordering operations and work which is still widely in use by software project managers to track the progress of projects (Jurison, 1999; Lock, 2007). With the enormous growth in information technology use since the 1970s, a new type of project manager emerged: the IT or software project manager. Unfortunately, this type of project manager need not have project planning or scheduling experience. New project management approaches emerged based on successful manufacturing techniques of mass production, of which the Waterfall approach by Winston Royce (1970) has become a prominent exponent (Lock, 2007). In software project development studies, the Waterfall approach is the one referred to predominantly (Huo et al., 2004; Jiang & Eberlein, 2008).

However, in response to growing environmental uncertainty and flexibility, the Waterfall approach is being criticized for its rigid character (Nerur & Balijepally, 2007). Although we understand the roots of this criticism, we cannot fully agree with it. We still see a lot of potential in the "old" approach and argue that if managed well, this approach can greatly contribute to EIS implementation.

This article aims to contribute to this debate by starting from the assumption that the Waterfall approach in practice is not as ill-suited to the dynamics of ES projects as its critics claim, since it is still the most widely used approach for ES implementation projects (Laplante & Neill, 2004). The leading research question therefore is: how does a Waterfall approach-based ES project cope with requirements uncertainty?

The remainder of the article is organized as follows. First we elaborate on the discussion on the origins and advantages / limitations of the Waterfall approach. After that, we present its main 'rival', the Agile approach, and assess its assumed strengths and weaknesses. Then we introduce our in-depth case study, a Waterfall approach-based ES implementation project in one of the biggest airline companies in the world, present our findings and draw conclusions.