

# One Size Does Not Fit All: Modeling the Relationship between System Development Methodology and the Web-Based System Environment

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## ABSTRACT

A consistent and reproducible approach to system development methodology is fundamental to information systems. Extensive research has been undertaken beginning in the 1970s to improve the processes and product. However, there still is no generally recognized approach. In January 2003 Avison and Fitzgerald asked in the *Communications of the ACM* "Where now for development methodologies?" In May 2004 Glass, in the same journal, asked for advice on how and when to use various methodologies in building systems. This research endeavors to address such questions by taking a more comprehensive approach to e-business methodology determination through an explanatory survey of a stratified random sample of Web Information Systems project managers from professional organizations and Fortune 1000 organizations.

## INTRODUCTION

System development projects have faced demands, pressures and risks since Royce (1970) first documented a methodology to increase success in project completion. Limitations of that process caused successive models to be developed by Boehm (1986, 1988) and Jacobson, Booch and Rumbaugh (1998), among others. The commercialization of the Internet and World Wide Web changed computing requirements and the business environment. The rigors of a formal disciplined process must be balanced with the need for speed and time-to-market pressures.

In the e-business marketplace, a competitor can quickly transform the competitive environment. Thus e-business system development must be both rapid and flexible. Further, e-business system development integrates marketing with systems analysis, and places a heavy emphasis upon branding and the user interface. These characteristics define an environment quite distinct from that of traditional IT projects, and thus demand that organizations entering the realm of e-business reexamine their traditional system development methodologies. This research-in-progress proposes a new customization model for e-business system development methodology. The model is developed in three steps. First, the nature of the e-business environment is considered. Then the relative strengths and limitations of existing system development methodologies, from the traditional Waterfall to Rapid Application Development and some of the newest agile methods, are examined. Finally, the characteristics of e-business are combined with those of the development methodologies, to yield a model for customizing an appropriate e-business development methodology.

## E-BUSINESS ENVIRONMENT

The model presented here (Figure 1) focuses on three primary factors: the organization, the project, and the team. Variables considered are an organization's culture, strategy, technology and integration expecta-

tions; the project's objectives, requirements, user profile, length of implementation, milestone approvals, and risk; and the team's skills, composition and experience. Volatility in the competitive marketplace, advances in Web technology and responding to changes in an organization's strategic direction exert pressure on the information system development process. The development of this model is detailed in Steinbach and Knight (2005).

## SYSTEM DEVELOPMENT METHODOLOGY FRAMEWORK

System development methodology refers here to the framework that is used to structure, plan, and control the process of developing an information system. Most methodologies can be placed into one of four major categories: linear or structured analysis and design, iterative, parallel or concurrent engineering, or agile (Steinbach & Knight, 2004; Knight et al. 2003). Each of these major approaches to system development methodology have been analyzed in terms of its strengths and weaknesses of project objectives and requirements, user knowledge, timeliness of installation, experience and composition of team members, project leadership, resource conservation and approval requirements. Each of the four development models has advantages and disadvantages but none is clearly best for Web information systems. Linear models do not provide flexibility nor are able to respond to time-to-market pressures. Parallel models view Web information system projects with an "end in sight" mindset that belies the organic nature of these systems. Many aspects of the iterative and agile models appear

Figure 1. E-business project environment (Steinbach & Knight, 2005)

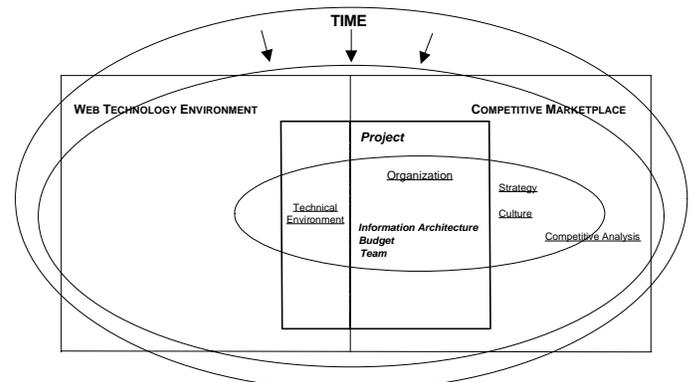
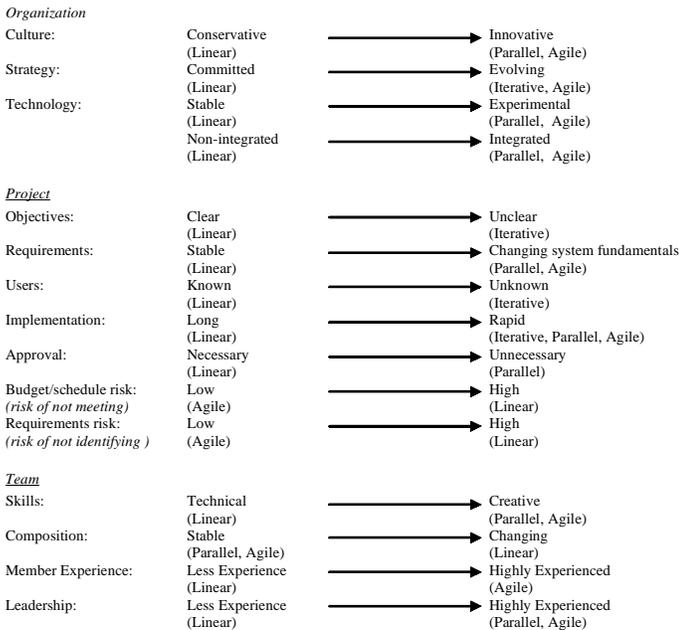


Figure 2. Model for evaluating e-business development methodology (derived from Knight et al., 2003)



to be better suited for the development of Web information systems yet there are limitations with both methodologies.

Figure 2, derived from Knight et al. (2003) shows the relationships between various development methodologies and organizational, project, and team variables. When an organization applies the model to a particular project, considering all their organization, project, and team variables, the model is unlikely to align perfectly with any one methodology. At this point, the project leader may select a methodology model that is a close fit, cognizant of that model's limitations when applied to his or her project. Alternatively, the project leader may elect to create his or her own "best practice" by combining various aspects of those models that most effectively address the organization, project and team variables.

## RESEARCH QUESTIONS

This study is designed to provide an initial response to Glass's question, as it applies to Web information systems. In particular, this study will:

1. Identify previously unrealized relationships between organization, project and team variables in the development of Web information systems;

2. Identify the methodologies that organizations actually use in the development of Web information systems;
3. Determine if organizations follow hybrid of methodology techniques; and
4. Identify relationships between how well the chosen methodology fits the organization, project and team, and how successful the project is.

## DATA ANALYSIS

A Web-based explanatory survey will be conducted. A stratified sampling of project managers of Web information systems will be drawn from members of the Project Management Institute (PMI), Cutter Consortium's email list, and non-affiliated project managers from Fortune 1000 organizations will be sampled. These individuals are more likely to possess the knowledge required to answer the survey appropriately since they have a demonstrated interest in the subject.

The survey data will be analyzed by an application of graphical modeling. Graphical models are multivariate statistical models that are often used to describe complicated problems involving a large number of variables. This facilitates the interpretation of the model assumptions as well as the communication between the researcher and the target audience. A joint probability distribution among the observed variables that satisfy some independence relations is assumed and can be represented through a graph. The set of graphs will represent the class of undirected graphical models.

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