12-31-2001

Critical Success Factors of Process Modeling for Enterprise Systems

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Abstract

The integrated and process oriented nature of Enterprise Systems (ES) has led organizations to use process modeling as an aid in managing these systems. Enterprise Systems success factor studies explicitly and implicitly state the importance of process modeling and its contribution to overall Enterprise System success. However, no empirical evidence exists on how to conduct process modeling successfully and possibly differentially in the main phases of the ES life-cycle. This paper reports on an empirical investigation of the factors that influence process modeling success. An a-priori model with 8 candidate success factors has been developed to this stage. This paper introduces the research context and objectives, describes the research design and the derived model, and concludes by looking ahead to the next phases of the research design.

Introduction

Enterprise Systems (ES) are standard software solutions that automate and integrate the core processes of a business using state of the art information technology (Klaus et al., 2000). Many Enterprise Systems initiatives commence with a strong business perspective but later on shift to emphasize technical functionality, mainly due to the complexity of these large integrated systems. This creates a gap between the implemented system and the way the organization works and thus, reduces the potential for achieving anticipated benefits from the Enterprise System investment. Process modeling is used within ES initiatives as an instrument to cope with the complexity and decrease the gap between the implemented system and the organizational requirements (Rosemann, 2000). ES success factor studies explicitly and implicitly state the importance of process modeling and its contribution to overall ES success (*e.g.* Wreden, 1998). However, no empirical evidence exists on how to conduct process modeling successfully in an ES context. The objectives of this study are to:

(a) Identify how and when process modeling can be used to yield more successful Enterprise Systems.
(b) Identify the critical factors and their interrelations that underlie process modeling success in an Enterprise System context.
(c) Analyze how the relative importance of process modeling success factors varies across the main ES lifecycle phases.

Research Methodology

The research design includes: (1) a literature review of potential process modeling critical success factors and success measures, (2) specification of an a-priori model based on findings from the literature, (3) an in-depth pilot case study to coarsely validate (model building) the success factors and success dimensions of the a-priori model; (4) an exploratory / explanatory multiple case study across a minimum of 4 firms (each firm would have conducted process modeling at some phase of their ES initiative) to further build and test the study model, and finally, (5) a survey to derive and statistically test the final model. We have completed a comprehensive literature review, derived the a-priori model and are currently in the process of further specifying the model with case studies.

An *A Priori* Model for the Critical Success Factors of Process Modelling

'Critical Success Factors' within the context of this research, can be defined as the key aspects (areas) where 'things must go right' in order for the process modeling initiative to achieve a high level of success (success to be defined shortly). A historical analysis of the emergence of process modeling identifies its early roots within the software engineering community (Curtis et al., 1992; Scheer, 1998b). The close ties that process modeling has with other software modeling domains (such as data and object-oriented modeling) is evident, both within the literature and in the design of popular process modeling tools and practices (Scheer, 1998a, 1998b). Given the lack of theoretical or empirical evidence on process modeling critical success factors, a review of relevant (analogous) literature within the traditional domains of software engineering and conceptual modeling was conducted.

Factors influencing the effectiveness of a system (or a system development and supporting methodology) are difficult to clearly separate from external factors surrounding its context (Kannellis et al., 1998). Sarker and Lee (1999) further re-enforce this fact in relation to process modeling, stating that the impact of Business Process Reengineering (BPR) tools are highly influential on their surrounding social phenomenon. Thus, (in addition to similar modeling arenas) literature related to the specific *application areas* of process modeling were also studied, with the objective of getting insights into the external social factors influencing process modeling success. The domain areas of generic IS studies, Business Process Reengineering and ES success were studied on this basis.

Figure 1 depicts the a-priori model for process modeling success factors derived from the literature. It has 8 candidate success factors [(1) Modeling methodology, (2) Modeling language, (3) Modeling tool, (4) Modeler's expertise, (5) Modeling team orientation, (6) Project management, (7) User participation and, (8) Top management support] and 2 dimensions [(a) actual usage and (b) perceived usefulness] or measures of process modeling success.

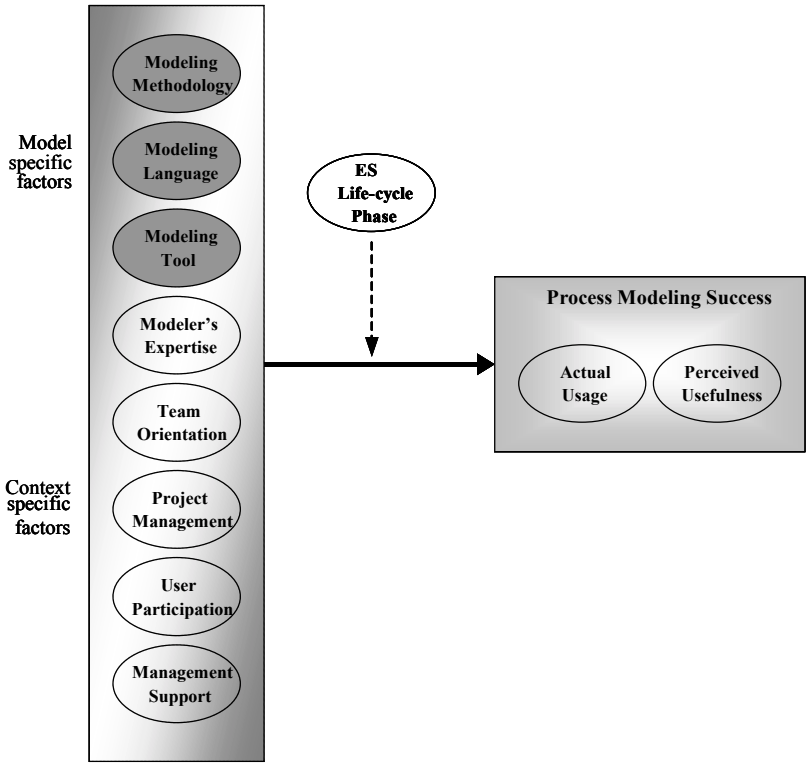

Figure 1. Process Modeling Critical Success Factors *A Priori* Model

Candidate Process Modeling Success Factors

The process **Modeling Methodology** is defined as a detailed set of instructions that describes and guides the process of modeling. It includes activities such as the definition of the model architecture, the modeling procedure, model lifecycle management and model quality assurance. For example, it should clearly define the modeling scope and the different levels of the model abstractions; and specify layout standards and naming conventions (*e.g.* Bancroft, 1998; Hammer and Champy, 1993; Rosemann, 1998). **Modeling Language** is the grammar or the "syntactic rules" of the selected process modeling technique (e.g. Petri Nets, Event-driven Process Chains) (Lindland et al., 1994; Krogstie et al., 1995a, 1995b). The **Modeling Tool** is the application that allows the design, maintenance and distribution of process models (*e.g* ARIS, ABC Flowcharter) (Davenport, 1993; Kettinger et al., 1997; Carr and Johannson, 1995). The importance of a tool, within the context of process modeling, pertains to its ability to expedite expected levels of model quality. For example, automatic syntax checks, consistency checks, layout placements, animations and filtering features that most modeling tools offer, would aid to obtain syntactic and pragmatic quality more efficiently (Curtis et al., 1992, Lindland et al., 1994).

The **Modelers' Expertise** describes the experiences of the project member in terms of conceptual modeling in general, Enterprise Systems and process modeling in particular (Moody, 1996; Lindland et al., 1994; Sumner, 1998; Holland et al., 1999). Ideally the modelers should have *business knowledge* (understand the processes that are being modeled; *company specific knowledge* (understand the organization specific issues pertaining to the process); *product knowledge* (understand the components and functionality of the tool being used); *technical knowledge* (understand how to apply the functionality of the selected tool within the existing system infrastructure and be able to interface with other systems), *project management knowledge* and *communication knowledge* (understand how to exchange ideas and communicate within the modeling team) (following Rosemann, 2000). **Modeling Team Orientation** refers to what is required when the individual team members work together internally (within the team) (*e.g.* a proper 'mix' of members, a team coordination strategy, and team leadership) (Sumner, 1998; Bancroft, 1998; Rosemann et al., 2000; Hammer and Champy, 1993). **Project Management** refers to elements that should exist, when the modeling team interacts externally with other involved parties (e.g. when the modelers interact with the users and sponsors) (*e.g* Rosemann et al., 2000; Grover et al., 1995; Murphy and Staples, 1999; Bancroft, 1998; Holland et al., 1999). **User Participation** (*e.g.* De Lone and McLean, 1992) describes the degree of input from users. Users are here defined as those involved with a business process, and consists of; the process owners, and the operational level employees. **Management Support** is the degree of tangible and intangible sponsorship received from higher levels of the organizational hierarchy (Sumner, 1998; Holland et al., 1999; Raymond et al., 1995; Hammer and Champy, 1993; Grover et al., 1985; Murphy and Staples, 1998; Larsen and Myers, 1998; Rosemann et al., 2000).

Candidate Dependant Variables

'Success', of Information Systems, especially in the area of Enterprise Systems is very difficult to measure as there is no established standard for evaluating it (Larsen and Myers, 1998; Seddon et al., 1999). Some argue that there is no single measure of success, but different perceptions influenced by 'context' (Kanellis, 1998; Seddon et al., 1999). Many IS related success studies have been conducted seeking to identify how to define and measure the success of IS. Many authors emphasize the importance of identifying the key 'stakeholders' for evaluating an IS/IT initiative (Seddon et al., 1999; Seddon, 1997; Larsen and Myers, 1998), arguing that "IS success is a conceptualized value adjustment made by an individual", from a given stakeholder perspective (Seddon et al., 1999, p. 248).

Based on these propositions from the IS/IT literature, **'actual usage'** (following Baroudi et al., 1986) and '**Perceived usefulness'** (following Davis, 1989) from the *modeling team's* and *model users'* perspectives, are proposed as the dependant variables to measure process modeling success in this study (see Figure 1). These two measurements fit well within the research context, by (a) evaluating the initiative from an 'ideal' versus 'actual' state and (b) capturing not only the perceived degree of importance of each factor, but also the extent of their actual use in real life process modeling initiatives.

Conclusion and Outlook

This paper introduced the context and the objectives of research on 'Success Factors of Process Modeling for Enterprise Systems'. It described the derivation of the a-priori process modeling success factors model. We are currently conducting case studies with the goal of: (1) understanding how process modeling is applied in an organization for ES management; and (2) identifying important issues and variables to further aid in the model design. The case design for this research includes an in-depth single exploratory pilot case study, followed by a more explanatory cross-case analysis of four organizations. The case protocol has been carefully designed and is currently being tested with the pilot case study.

The process modeling critical success factors model will then be derived. Case results will be used to refine the success factors identified in the a-priori model and literature will be used to design the survey instrument by identifying potential indicators to measure each factor of the model. A worldwide survey, targeting past and present Enterprise Systems process modeling team members and users will be conducted to finalize the model. The goal of this survey would be to conduct factor and correlation analysis of the individual factors and process modeling success, to justify; (a) the process modeling success factors and their inter-relationships and (b) their importance for the overall success of a process modeling project.

References

References available upon request from authors.