EAI Implementation Project and Shakedown: An Exploratory Case Study

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Abstract

Enterprise Application Integration (EAI) is a pertinent approach to integrating core business processes and data processing in the organization. Based on a generic enterprise system experience cycle model and previous research on EAI and enterprise resource planning (ERP) projects, we propose an initial framework for the EAI implementation process. The framework is then applied in an exploratory case study of an EAI implementation project in a Norwegian energy group. As a result, we suggest a revised framework for the EAI implementation process. The revised framework identifies ten new factors based on the findings from the case study, which affect core business process integration by EAI,: two in connection to the chartering phase, six related to the project phase, and two for the shakedown phase of the enterprise system experience cycle. The framework provides guidance for practitioners when planning for EAI implementations.

1. Introduction

Several corporations invest significant development resources to achieve standardized, corporate-wide data and process architectures to support their business strategies – preferably in a flexible manner [1]. Until recently, Enterprise Resource Planning (ERP) systems have been regarded as a common way of achieving such a level in the development of corporate information technology architecture, which has also been coined as *rationalized data architecture* [1]. Lately, *enterprise application integration* (EAI) technology has, however, emerged as an alternative or a complementary addition to ERP in order to build integrated enterprise-wide information systems [2][3-5].

In an EAI solution, middleware offers connectivity to information processing services, workflow technology provides process management, and transformation products offer data transformation services [5].

In contrast to ERP implementations, a limited body of empirical research on EAI implementations exists. So far, mainly the initial stages of introducing EAI technologies in organizations have been studied [5]. This paper contributes by exploring an EAI implementation project from the project chartering phase, via the project phase until the shakedown phase, thus covering three of the four phases of the "enterprise system experience cycle" [6].

Based on a combination of ERP and EAI implementation literature, an initial framework for the EAI implementation process is proposed. The proposed framework is then applied to the analysis of a case study [7] in a Norwegian energy group. Based on our findings from the case study, we propose a revised framework with ten new factors. These factors are new, both with regard to the issues identified in the ERP literature and previous EAI research.

The discussion focuses on how EAI implementation in this case differs from ERP implementations. The revised framework should provide guidance for practitioners when planning for EAI implementations by focusing management issues that were found important in our case, especially in the project phase. We conclude with suggesting issues for future research on EAI implementations.

2. Theoretical Foundation

The enterprise system experience cycle model by Markus and Tanis [6] "provides a theoretical framework for analyzing, both retrospectively and prospectively, the business value of enterprise

systems" such as ERP or EAI (p173). As it provides a comprehensive model to conceptualize enterprise system implementation projects, we chose it as the theory basis to organize our study.

2.1. The enterprise system experience cycle model

The enterprise system experience cycle model consists of four phases [6]:

Phase I: The Chartering Phase consists of decisions defining the business case and solution constraints. Key activities include building a business case, identifying a project manager, and approving budget and schedule. Selecting integration solution and vendor(s) may also be part of this phase, or it may be deferred until the project phase.

Phase II: The Project Phase consists of activities intended to get the system and users up and running. Key activities include software configuration, system integration, testing, data conversion, training and rollout.

Phase III: In the Shakedown Phase the organization comes to grips with the enterprise system. The phase lasts until normal operations have been achieved. Key activities include bug fixing and rework, system performance tuning, retraining, and staffing up to handle temporary inefficiencies.

Phase IV: The Onward and Upward Phase consists of normal operation until system upgrade or replacement. Characteristic activities include continuous business improvement, additional skill building, and post implementation benefits assessment. This phase is about achieving results, maintaining the system, supporting the users, upgrading, and maintaining an innovative attitude for the future.

We used the enterprise system experience cycle model as an organizing framework for our work, commencing with a survey of the EAI and ERP literature.

2.2. EAI Factors

A model of the factors that affect EAI adoption was developed by Themistocleous [5]. Since this model is relevant for decision support during the phase of introducing EAI in an enterprise, we relate the model to the chartering phase. A "factor" in this context is a fact or condition connected to an event or action that contributes to producing a result. The factors identified by Themistocleous [5] are:

(1) External pressure, imposed on the enterprise by the environment, may include competitors, trading partners, customers and suppliers [5, 8, 9].

(2) Internal motivation or pressure that can arise within the enterprise. This may be strategic, technical, organizational, operational, financial or managerial in nature [5].

(3) Existing IT infrastructure in the enterprise may inhibit management to make accurate decisions because of systems heterogeneity, data redundancy, and low data quality [5, 9].

(4) Perceived benefits of EAI often function as a lever to obtain the needed commitment and acceptance to get the project going [5].

(5) Barriers in the form of challenges or risks may include the high complexity of understanding processes and systems in order to integrate them, political issues, that no single EAI technology is available to solve all integration issues, resistance to change, lack of EAI skills and insufficient training [5].

(6) Costs, which may be categorized into direct costs, indirect human costs, and indirect organizational costs. EAI implementations will incur considerable costs of software, development, consultancy and organizational restructuring [5].

(7) IT sophistication, which includes the technical expertise related to integration technologies in the enterprise [5].

(8) Support and Evaluation frameworks, which include support from vendors and consultants and frameworks to evaluate integration technologies and assess EAI packages. Enterprises put money and effort into evaluation frameworks and view them as important decision making tools [5].

These factors are arranged within a process framework in section 4.

2.3. ERP Factors

In the chartering phase, important factors in ERP implementations are related to project scope and objectives, focus on a small set of priorities, specific performance targets, focus on core processes, in-house competency, top management support and commitment, commitment to change, and a full-time project champion [1, 3, 6, 10-14].

The ERP literature also discusses the project phase [1, 3, 6, 10, 12-17]. Important factors include issues of project management, change management, top management advocacy, business expertise, technical expertise, organizational change expertise, business and IT alignment, training in system and business processes, system and module testing, and rollout strategy.

The shakedown phase factors of ERP implementations include the need for additional resources to smooth the enterprise transformation, turnover of project personnel and managers, top

management engagement, additional changes in processes and procedures, retraining or additional training, and commitment to change [1, 3, 6, 10, 12, 14].

Our review thus revealed a body of ERP literature related to the first three phases. These ERP factors that we found are incorporated into the process framework that we present later in this paper. The literature survey revealed as well research on the chartering phase of EAI implementations. However, we were unable to find empirical research on EAI implementations covering the project and shakedown phases. Hence, we considered an exploratory case study regarding these two phases of EAI implementation as a relevant research effort.

3. Background and research process

We conducted an exploratory, interpretive study [7] in Agder Energi, a Norwegian energy group. The company has 900 employees. The operating income was about 0.3 billion Euros in 2003. Agder Energi operates power plants and transmission networks, with a broad range of energy and telecom products. The company developed a rationalized data architecture supporting customer-oriented business processes over a period of 2 years, starting the chartering phase in February 2002. The project phase lasted from August 2002 to September 2003, with a shakedown phase ending February 2004.

The study took place between January 2003 and May 2004 focusing on the project and shakedown phases of the implementation of a rationalized data architecture by EAI. Our objective was to investigate why and how Agder Energi implemented an EAI solution, what challenges were met, what contributed to the assumed success, and what had been learned.

The data includes face-to-face semi-structured interviews with six informants, follow-up questions, and several hundred project documents of different types. We conducted two semi-structured interviews in April 2003 and 5 semi-structured interviews in March and April 2004. The interviews lasted 1-1.5 hours, involving the following stakeholders: one from top management, two from project management, one consultant who also performed project management, one super user and one customer center manager. All interviews were recorded and transcribed. Follow-up questions were raised in informal meetings, e-mails and phone calls.

A security clearance gave unlimited access to project documents. A total of 767 documents were examined, and of these were 358 documents considered important for this research. The documentation covered the project chartering, the project, and the shakedown phases. These documents were related to strategy, project administration, business processes, ICT infrastructure and systems, integration and development, competence and training, and publishing. The documents included supplier and vendor documentation, archival records and physical artifacts from the project room.

The data analysis followed the hermeneutical mode, with rounds of analysis after each interview. Document analysis and interviews progressed in parallel. Two researchers performed preliminary interpretation of the data separately. The data were categorized and coded according to the enterprise system experience cycle model, which we had supplied with the ERP and EAI factors found in the literature study. After the data analysis, our tentative framework was compared and adjusted according to the challenging and important issues that emerged from the interviews and documents. There were numerous iterations of analysis, alternating between the detailed data and the tentative framework. Several re-categorizations were conducted, and gradually a modified framework of factors emerged. During the entire analysis process the identified issues were based on more than one data sources, following this principle of triangulation.

4. The case study

In 2001 Agder Energi underwent what Ross [1] labels as the standardization of IT architecture. The competitive market environment led the company towards a strategic focus on their downstream operations, pursuing increased customer satisfaction by utilizing company infrastructure for creating new product and service concepts. This move towards a multi-service concept required simplified procurement and payment processes, which were to be implemented by using EAI technology. In general, the EAI initiative was part of a general-level strategic focus on efficiency of business operations and positioning the enterprise for future growth.

The EAI implementation included design of new customer-oriented business processes in the following domains: product development, marketing, sales, orders, delivery and settlements. Oracle9i AS and Oracle9i InterConnect, a metadata-driven message broker, constituted the EAI solution. Several new systems were implemented and integrated in the EAI solution, such as the ElWin system for energy products and the IMS system for telecom products. A total of 12 internal and external systems were integrated.

Commenting on their choice to use EAI instead of choosing a comprehensive ERP package, the Vice President of Strategy and Business Development stated:

"The strength of the concept [EAI] lies in that first you build a business process, then you build the architecture, and then you build an enterprise".

4.1 Background for the framework

Our proposed framework was based on the ERP and EAI literature referred to in section 2. A revised EAI implementation process framework resulting from the case study is presented in the following. The objective of the framework is to clarify the factors relevant to the different phases of an EAI implementation project. The framework summarizes important factors from the ERP literature, the EAI literature on IT architecture development, and new factors from our case.

4.2 The Chartering phase

The revised chartering phase framework is presented in Table 1. Column one aggregates the factors. ERP and EAI factors from the literature survey are listed in columns two and three (cf. section 2). Column four indicates the extent to which these factors were recognized in our EAI case.

Factors were only regarded as "Important" if they emerged from several data sources. The factor which was labeled "little attention" gained only partial or hardly any support from the data. A "New" factor means that we discovered a factor not identified in our literature survey; a factor which we found important in the data collected in this case.

Table 1. Revised Framework for the Chartering Phase

Group	ERP Factors	EAI Factors	EAI Case Findings
Current state analysis		❑ External pressure ❑ Internal motivation ❑ Existing IT infrastructure	❑ Important ❑ Important ❑ Important
Construct a business case	❑ Determine scope and objectives ❑ Small sets of priorities ❑ Set of measures ❑ Identify core processes ❑ Keep capability in-house	❑ Benefits, Barriers, Costs	❑ Important ❑ Little attention ❑ Little attention ❑ Important ❑ Important ❑ Important
Select integration SW solution (May to some extent be performed in the project phase)		❑ IT sophistication ❑ Support ❑ Evaluation frameworks	❑ Important ❑ Important ❑ Important ❑ Replacing existing systems (New) ❑ Proof of concept (New)
Top management support	❑ Support and commitment from the top management		❑ Important
Commitment to change	❑ Commitment to change ❑ Project champion		❑ Important ❑ Important

Two factors were given little attention by the informants in this phase. To limit the project effort to a "small set of priorities" and accomplish these is a critical ERP factor, as the transformation into a

rationalized data architecture demands significant managerial resources [1, 6, 10, 14].

The factor labeled "Set of measures" was also given little attention in our case. In the literature, this factor has addressed specific performance targets and a way of tracking them, which should help keep the project on track and enable enterprises to become more process-based [3, 6, 11-14].

In the chartering phase the fundamental decision on EAI to be preferred instead of ERP was taken. More detailed features of the future EAI solution were not decided until the project phase. Since they may occur in either phase, these factors are grouped together under "select integration SW solution" (cf. section 5).

The first new factor found, "Replacing existing systems", refers to the challenges concerning legacy systems in relation to EAI implementations. Agder Energi used the existing IT infrastructure combined with new technology to develop an integrated platform. The integrated platform had system requirements such as openness, availability of API's, business process requirements and e-business requirements. These led Agder Energi to replace a core customer system and some product systems. This added an extra burden on the enterprise, which was changing business processes and culture simultaneously as new systems were rolled out to end-users.

Another new factor found in our case was the need for the "Proof of concept". Whereas an evaluation framework was used in the initial vendor/technology evaluation, the final vendor decision was based on a proof of concept. The Project Manager of System Integration stated:

"They got some homework, where we defined what they should do. Then they had to come to our premises, and we watched them perform the task over their shoulders, to see how easy it was to get things done in real life. ... And that was decisive for our choice".

4.3 The Project phase

The revised project phase framework is presented in Table 2. There are no previous EAI factors in the literature for this phase, so it only compares our findings with factors from the ERP literature.

Table 2. Revised Framework for the Project Phase

Group	ERP Factors	EAI Case Findings
Organization		❑ Project organization (New)
Management	❑ Project management ❑ Change management ❑ Top management	❑ Important ❑ Important ❑ Important
Ownership		❑ Project ownership (New)
Skills	❑ Skills ❑ Balanced team	❑ Important ❑ Important
Business processes		❑ Designing new business processes (New)
Build an enterprise application integration solution	❑ Data management ❑ Alignment between business and IT ❑ Training ❑ Testing	❑ Conceptual integration solution (New) ❑ Technical integration (New) ❑ Important ❑ Important ❑ Little attention ❑ Important
Rollout	❑ Rollout	❑ Important ❑ Receiving project (New)

"Training" was the only factor that had been emphasized by the ERP literature but given little attention in this phase. Many studies emphasize training; since it facilitates commitment to change, and increases user involvement in projects [3, 6, 12-14, 17, 18].

"Project organization" is the first new factor identified in this phase. It describes how the project is rooted in the enterprise. Organized as an enterprise project, top management were involved in the project's steering committee. Several of the respondents viewed this project organization as decisive. As the Customer Center manager stated:

"Lift the project out of the companies, and let them work freely according to budgets and they have a common mandate towards the market. Let them agree on what is best, go through with it before you dispatch it down to the subsidiaries".

The super user stated: "It [the project] had an enormous focus, not just from us, but also from the top, the management, we have never experienced anything like it before".

"Project ownership" is another new factor, identified at several levels. This refers to activities performed to ensure employee loyalty and interest in the solution. The project management defined roles in a matrix of responsibilities that affected all participants. This gave a good understanding of the different project domains, responsibility and participation. Everyone had defined roles and knew the roles of other participants. It was ascertained that employees were comfortable with their own roles and respected the other roles. Project-related artifacts such as cups, letter paper and sweaters with the project logo contributed to attention and ownership in the organization. Enthusiasm and a sense of ownership of the project largely prevailed among the informants. The Controller remarked:

"Several participants were so proud to be part of the project that when it ended, they did not want to leave" … "You simply get so engaged, and it has been an exciting project. I think you would have to examine a large amount of projects until you find one that has delivered like DDAE. I am pretty sure of it."

"Designing new business processes" is a third new factor identified. Designed early in the project, new business processes were viewed as a precondition for developing a solution that supported the enterprise strategy. New business processes were even viewed as a precondition for selecting the right technology, designed before any evaluation of integration technology. High-level business processes were designed from scratch, starting with a customer's viewpoint. A new business model with predicable and rigid business rules was in place before investing in technology and skills. As stated by the Vice President of Strategy and Business Development:

"We started with the business processes. That was the first thing we did, business people were doing it. If we didn't do that, how would we know what to build?" The business processes represented a control mechanism for the systems. The Controller:

"We have been using and use business processes to check that we are on track according to the systems; what we should do [and] what the systems should do to support and deliver products to the customers".

Another new factor is "conceptual integration solution", the plan for the roles that different systems will have in the EAI solution. Using a modularized view of the different IT systems and their functionality, the modules were integrated according to business process rules and data synchronized by EAI technology. We include this as a factor because it affects the actual integration of the systems and how the new architecture positions itself for the next IT architecture stage.

"Technical integration" of the different systems that constitute the EAI solution is another new factor. The resulting integration platform is affected by how the systems are integrated in relation to IT business alignment, by whom and with what technology. The core business processes were bundled into the infrastructure, and 12 systems were integrated by adapters according to a hub and spoke topology.

The final new factor is labeled "receiving project", based on the internal term picked up from the data. A receiving project complements the implementation project itself, as it prepares the receivers for the developed integrated platform. The receivers were subsidiary companies within the enterprise, related to downstream operations. A receiving project clarifies the responsibilities of the different receivers, and manages the rollout of the solution in a controlled way. The problems experienced during the shakedown phase led to the identification of this factor.

"We simply got to have receiving projects spanning relatively long time [frames], a project spanning one year needs a receiving project spanning half a year. Not just a month at the end." (Vice President of Strategy and Business Development).

The replacement of the legacy systems emphasized the importance of a receiving project in this case.

4.4 The Shakedown phase

The revised shakedown phase framework is presented in Table 3.

We did not identify "turnover" of personnel or "resistance to change" in the case. However, we found much less "top management support" in the shakedown

phase. The attention from the top management started to decline after the project phase, which was expressed as a problem. For example, it became difficult to get the steering committee to show up at the steering committee meetings. An informant put it this way:

"If you run incredibly fast the first 800 meters of 1000, you can run as fast as lightning, [but] it doesn't help at all unless you run the last 200."

The focus on organizational change in the first phases of the project was stated to be a possible reason for the declined interest by the top management. As organizational change became less important in the latter phases of the project, the top managers lost some of their interest accordingly.

Table 3. Revised Framework for the Shakedown Phase

Group	ERP Factors	EAI Case Findings
Address and deal with errors of previous phases	❑ Additional human, financial, and technical resources ❑ Turnover ❑ Top management support	❑ Important ❑ Not found ❑ Little attention
Make new business processes work	❑ Changes in processes and procedures ❑ Retraining and additional training ❑ Resistance to change	❑ Important ❑ Important ❑ Not found ❑ GUI (New)
Handover		❑ Handover (New)

Graphical User Interface ("GUI") is a new factor of an EAI implementation that differs from ERP. In an ERP system the GUI is typically unified, which was, however, not the case in the EAI solution of the target organization. Although the systems were integrated, the GUI was not. The users had to relate to many different systems, such as the electricity expert system, systems for broadband and other products, and the multi-service system. In addition the GUI of the new core customer system was perceived as too complicated. A simple integrated user interface is still needed, to achieve effective operations. With the words of a super user:

"There is a lot of clicking involved, and this is something we didn't realize until the end users started using the system, it [the GUI] is too time-consuming and cumbersome."

The Customer Center manager stated:

"The first thing we have to do is to simplify some of the operations we do in the system. Secondly, we need a service desk [a new layer on top] where most of the operations are happening. Only specialists will work directly with the systems." … "We use more time on some of the operations in the end-user interface now, than we did in the old systems."

"Handover", transferring the responsibility for the solution from the project to the enterprise, is another new factor. The project tried to hand over the operation of the integrated platform early in the shakedown phase. But the enterprise had to adjust to the new structure. When the solution eventually was handed over, the enterprise did not assume full ownership of the integrated platform. The responsibilities for the different domains of the integrated platform could have been more clearly defined. The Controller commented:

"What we have not managed in an acceptable manner, is transferring the solution to the organization, and making them in charge of systems operation."

This is in line with the Customer Center manager: "We use the system, and have super users and all, but I'm actually in doubt of whether we formally have taken over the responsibility of it."

5. Discussion

We found more similarities than differences between the ERP implementation literature and this EAI implementation case. Most of the ERP factors identified from the literature were present also in our EAI case. In the following, the discussion thus focuses on the new factors found, which were neither present in the ERP literature nor in the previous EAI literature.

In the project phase, the most important difference between our EAI implementation case and reported ERP

research is how the IT and business processes are aligned and wired together. For ERP systems these are typically best practice business processes, forcing the enterprise to adopt the system by changing their business processes accordingly. For EAI, the business processes have to be designed or mapped before the systems can be integrated. The core business processes determine the requirements for the integrated platform, which must support the business processes. This coincides with the literature proposing that business processes form the technical solution for EAI, whereas the acquired software form the business processes for ERP [2-5]. This suggests that an EAI solution may be more comprehensive than ERP with regards to designing new business processes, since there are no best practices to adopt. On the other hand, organizational changes with ERP may be more comprehensive.

The business processes were in this case designed before any particular integration technology was evaluated. The designed business processes were used to secure the alignment of the system integration and business requirements. Once the processes are wired into the infrastructure, they will demand extra resources to be changed later. Moreover, the enterprise did not evaluate any specific EAI technology before deciding on the adoption of EAI. This was not considered problematic by the informants, although contradicting a recommendation by Themistocleous [5]. The evaluation of EAI and need for related competence was initiated in the project phase, i.e. after the decision to adopt EAI. However, the preferred solution, i.e. an IT architecture integrated by a particular EAI software, was identified during the chartering phase. Former case studies suggest that evaluation of EAI technology before the adoption decision is a common approach [5]. In our case, however, this did not emerge as a necessary success factor for developing an integrated platform. According to Markus and Tanis [6] the selection of an ERP software might be conducted either during the chartering or in the project phase, and the case evidence suggests that in EAI projects the timing of this decision may vary alike.

Definition of performance indicators and metrics have been identified as an issue in ERP projects [3, 6, 11-14]. Previous research on ERP implementation states that inconsistent or limited measurements in the chartering and project phases can lead to problems in later phases [13]. During this case we found little evidence of active performance measures, except for economical performance measures by budgets. Key performance indicators were defined within the project, but the target organization did not use and test them in a consistent way throughout the phases. The measurements seemed to work well in the project phase, but in the shakedown phase and in the early onward and upward phase the measuring activities somewhat disappeared. One possible reason may be the decreased focus on the project by the top management during the shakedown phase.

An unexpected similarity between this EAI implementation and ERP was the need for training, triggered by the replacement of core systems. The implementation of ERP involves replacing existing system with a new one [6], but previous EAI research has pointed to how EAI can integrate systems without the need for replacing them [2, 3]. However, although EAI in itself does not demand the implementation of new systems, in this case the EAI implementation resulted in a necessary replacement of legacy systems. The existing systems did not satisfy the requirements of the future IT architecture. The replacement of the legacy systems resulted in problems that are typical for ERP implementations, such as inadequate end user training. The case shows that due to possibly unavoidable core system replacements, the training factor may be as important for implementing EAI as for implementing ERP systems.

Agder Energi experienced a dip in business performance after system rollout. The new structures were evidently not enacted and fully trained before the system roll-out. Some technical problems also led to reconfiguration of one part of the solution. A positive result that was especially highlighted during the shakedown phase was a successful annual settlement process; reducing the effort from 12 hours to 40 minutes. The annual settlement ran smoothly, the mission-critical integrated electricity solution worked well, and the data quality was good.

The relative focus on the new factors discovered, does *not* imply any disparagement of the factors given little attention in this case. Although some previously identified factors were less visible in this case, we have no indication that they are unimportant in general. Rather, further analysis of the relationships between the factors among several cases could most probably reveal new knowledge of the phenomenon as a whole, which this single case alone cannot reveal.

The strength of this case study is the amount of in-depth data, especially the extensive number of relevant project documents. However, this study is limited in two respects. It is based on a single case and it has followed two phases, project and shakedown, of the four phases of the whole enterprise system life cycle. Our entry into the company occurred after a completed chartering phase. Although informal communication from the chartering phase is missing, all written historical records were available and analyzed. The onward and upward phase had only recently started as this research effort concluded.

Our evidence suggests that success in one phase does not necessarily lead to success in other phases. The project phase was regarded as a great success among the

informants, e.g. concerning the project timetable, budget, and risk management. However, unexpected challenges emerged during the shakedown phase. Our evidence also suggests that factors in each phase affect the execution of later phases. This corresponds to the findings of Markus and Tanis [6]. We therefore suggest that the revised framework for EAI implementation process, presented in section 4, is useful both for practice and research. The framework can be used as a reference whether, why and how to implement a rationalized data architecture by EAI. It can also provide a useful perspective on the entire enterprise system life cycle in cases where EAI is preferred instead of ERP solutions. This foresight can enhance proactive management of the EAI implementation. Researchers can use the revised process framework as their starting point to further explore the issues of EAI implementation, especially concerning the project, shakedown, and onward & upward phases.

6. Conclusion

Our case represents an exploratory case study of an EAI implementation as a technology for achieving a rationalized IT architecture. Such an EAI implementation effort can be viewed in light of the enterprise system experience cycle [6], which consists of four phases (chartering, project, shakedown, onward and upward). Each phase consists of factors that represent possible opportunities and constraints to be experienced in relation to EAI implementation efforts. The factors in one phase influence the actions and possibilities in the following phases. However, success experienced in one phase does not automatically lead to success in another phase. This is consistent with enterprise systems literature stating that most problems related to implementation are experienced in the shakedown phase.

Based on the case study we presented a revised process framework that contributes at a conceptual level. It incorporates factors identified in previous studies of EAI and ERP. Compared to the previous ERP and EAI literature, we have identified ten additional factors in our case, factors that we suggest to be specific for EAI implementations. These factors may help managers to plan for EAI implementations, to set appropriate expectations, and to anticipate challenges that remained unanticipated in this case.

We also experienced that project outcomes measured at one point in time may be only loosely related to outcomes measured at another point in time. This is a challenge for research. There is much work to be done to understand how issues relate between the different phases of the implementation process. It is important that future research on EAI implementations takes the stand of process research, investigating the entire implementation experience. The revised process framework suggested here would then benefit from verification and refinement by further studies.

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