

# Framework for understanding ERP development ecosystems: business and technology perspectives

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**Abstract.** Strategic alignment between business and IT is considered critical for competitiveness. Enterprise system and business process reengineering projects are inter-related and have a major impact on strategic alignment. ERP systems are developed in multiple stakeholder ecosystems. Current literature does not provide sufficient support for this. The aim of this paper is to identify business and technology perspectives' stakeholders. As a result, a combined framework of ERP development ecosystem stakeholders is created. The combined framework increases complexity and the number of stakeholders. Nevertheless, it offers a holistic view. Our framework offers implications for both literature and empirical research and also for IS practice.

**Keywords:** ERP development ecosystem, Business-IT alignment, enterprise system, business process reengineering

## 1 Introduction

Customer needs and business environment evolve continuously. In order to survive, also organizations must follow this transformation. Information technology (IT) is a part of this change, even though many issues need to be considered [1]. For example, from the strategic perspective, it is acknowledged that alignment between business and IT strategy is essential for organizations to gain competitive and strategic advantage, and to maintain it [2]. Yet the alignment is not seen as a fixed state or a single event, but as a continuous process over time [2;3].

To improve alignment is about changing the organization. This implies that social factors need to be considered. The impact of this change to both technology and processes and further to people, structure and management can be justified with almost any socio-technical change model [see e.g. 4;5]. Alignment is approached from two viewpoints: intellectual and social. Intellectual alignment focuses on organization's plans and outcomes while social alignment addresses the issues with mutual understanding and commitment between IT and business people. Social dimension of alignment has been less explored. [6;7]

Strategic alignment includes both business and IT domains. Strategic Alignment Model (SAM) [3] is probably the most cited framework for strategic alignment [1;55].

SAM is used as basis for this paper; it introduces two perspectives, namely strategic fit and functional integration. Strategic fit concentrates on alignment between the organization's external and internal domain while functional integration focuses on alignment between IT and different business functions [3]. This implies that the development of strategic IS requires different stakeholders' involvement.

The ability of IT to offer strategic advantage is generally not understood [7]. In particular this has turned out to be quite problematic with enterprise resource planning (ERP) systems where several famous failures have been reported, for example US Air Force<sup>1</sup>, Hewlett Packard and Hershey<sup>2</sup>. Despite the fact that many challenges related to enterprise systems (ES) projects were already been noted over ten years ago, system implementers still struggle with those same problems [8]. Common conception is that many ES projects fail to meet the objectives.

The multitude of stakeholders involved in ES projects has been identified [9;10;11]. Still, there are surprisingly few papers that actually focus on ERP development ecosystems, i.e. on the organizational stakeholder networks which construct the ERP system. Especially knowledge management and communication between these actors or stakeholders have remained a rarely studied issue [11;12;13]. According to Addo-Tenkorang and Helo [14] most of the ES research is limited only to discussing one or two stakeholder roles. It thus seems that current ES literature does not provide sufficient viewpoints to understand or conduct all kinds of changes needed in the alignment activity [8].

ES implementations are usually accompanied with changes in business processes [23]. The need for more holistic view of the change is also noted in business process re-engineering (BPR) literature [15;16]. BPR is often used to understand and cope with organizational transformation [17]. It focuses on cross-functional processes [18] with various stakeholders. The earlier stated problem of not seeing IT as strategic advantage is taken into account in BPR by considering IT not only being a support function but also being an enabler for new business opportunities and possibilities [19].

Taking the abovementioned deficiencies into account sets the objectives for this paper: we want to construct a framework for understanding ERP development ecosystem and its dynamics thoroughly. The framework would provide a holistic view to both IT and business viewpoints by merging ERP and BPR literature together. This would highlight the IT-business alignment issues (c.f. [3]) that have been identified challenging. Similarly, by mapping out the ERP ecosystem, the existence of different stakeholders will be made evident. Our research questions are: How has IS literature taken ERP development ecosystems into account? What kinds of stakeholders will different perspectives ES and BPR bring to ERP development ecosystem?

Instead of a common strategic perspective, we approach the topic pragmatically, from the micro and macro levels [20]. Few well-known articles were chosen as a basis of the paper. For business-IT alignment, and for the whole paper, Henderson and

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<sup>1</sup>[http://www.cio.com/article/721628/Air\\_Force\\_scraps\\_massive\\_ERP\\_project\\_after\\_racking\\_u  
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<sup>2</sup>[http://www.cio.com/article/486284/10\\_Famous\\_ERP\\_Disasters\\_Dustups\\_and\\_Disappointmen  
ts](http://www.cio.com/article/486284/10_Famous_ERP_Disasters_Dustups_and_Disappointments)

Venkatraman [3] was selected as a corner stone. For ES perspective the starting point was Davenport [26]. For BPR perspective both Hammer [18] and Davenport and Short [19] were chosen. The literature was used to create the frameworks in a non-systematic way. Additional literature was selected with forward and backward searches [60]. Google scholar was used to go forward by tracking down following citation from initial and later found articles. References of the selected articles were looked through in order to go backward. Also while searching the selected literature few articles suggested by the search engine were included. Search for relevant stakeholders was ended when no new occurrences were found.

Contributions are interesting for both IS professionals and academics. In practice the framework serves as a tool for decision makers in project planning and for project leaders in management of the project. For academics future research issues are pointed out.

The structure of the paper is as follows. First the connections between the concepts are justified by pointing out common principles and positioning them in relation to each other. Then an initial framework for ERP development ecosystem is outlined. After that the stakeholders from both chosen perspectives are identified. In discussion the perspectives are combined and viewed from strategic alignment point of view. Also future implications are discussed.

## **2 ES and BPR relationship**

ES and BPR are not complimentary even though usually they are said to support each other, and their simultaneous use is considered to lead to better results [21;22]. ES and BPR both focus on processes instead of single functions. According to Robey et al. [23] business processes have to be changed regardless of chosen approach to implement ERP system. Same is pointed out by Huq et al. [24] with a notion that ERP system implementers need to redesign existing processes to properly fit the software. This leads to a claim that ERP implementation can be seen as an organization-wide BPR project. Still, the ES implementation project does not explicitly reengineer the processes, but drives the organization to do that [24].

The dilemma with ES and BPR is their balance in customization. For example the best ERP solutions only cover a maximum of 80% of the workflows of an organization [22]. ERP should thus be customized entirely, which, however, leads to much higher acquisition and maintenance costs, and eventually more complicated upgrades and services [25]. This is mainly caused by the contemporary trend towards ERPs as package software instead of tailored “build from the scratch”-system [13]. Consequently it is usually financially more favorable to change the business processes to comply with the ERP even though the danger for losing the competitive advantages is evident [26]. This is concretized in the cases where the competitive advantage origins from highly specified processes, for example, unique customer service. In case of package ERP, the processes are standardized towards the software vendor’s view of the best business processes [22;26].

ES, BPR and strategic alignment are all interconnected. Business-IT alignment can be seen as a higher, strategic initiative or catalyst which seeks a change in order to

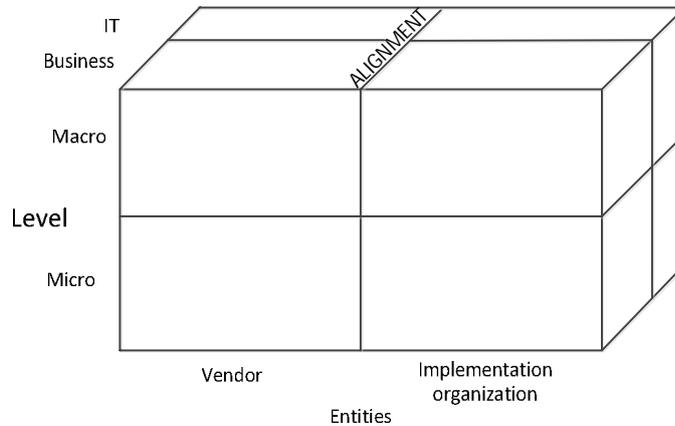
achieve competitive advantage or leverage organizational competence. BPR is considered as tool to make that change happen while ES is a tool to implement the change i.e. ES could be used to assist in deployment the redesigned processes into practice. If applying the classic model for organizational change [27], where change is happens through unfreezing-change-freezing phases, BPR could be used in unfreezing phase and ES in change phase [28]. The preferred solution is to apply BPR prior to ERP although it has been argued that BPR can also be useful after the implementation [21;28;29]. In relation to SAM, BPR would mostly cover the strategic fit in business domain and the functional integration on internal level. ES again would cover the strategic fit within IT domain and also the functional integration on internal level. This further urges the need to consider both viewpoints.

### **3 Initial framework**

IS are often developed in cooperation between a number of parties, especially when the technology is integrated in organizational setting [30]. The more strategic the information system is, the wider range of stakeholders is involved in decision making process. Stakeholders, i.e. any individual, group or organization that can affect or is affected by the ES [30], also have indirect and complicated interrelationships. This means that by focusing only on their direct connections, the ecosystem cannot be completely interpreted. Nevertheless, all level actors who can influence the ES development should be regarded as stakeholders.

Markus and Robey [20] argue that studying the relationship between information technology and organizational change necessitates the identification of the level of analysis, and different entities. Roughly, individual, group, organization, and society levels can be disentangled. Also the distinction between micro and macro level should be done because they usually rely on different causal structures.

These issues; IT and business, micro and macro, and vendor and customer, sets the basis for our initial framework. The distinction between micro and macro levels is used to identify which organizational level is concerned when addressing different stakeholders. The trend of choosing pre-packaged ERP systems imply that ERP development network consist of at least a vendor and the customer organization [26;31;32]. Altogether, these issues suggest that the ERP development ecosystem framework can be described as a cube, illustrated in Figure 1 below.



**Fig. 1.** Initial ERP development ecosystem framework

#### 4 Enterprise System perspective

Since ES is both strategic choice and enterprise-wide system, it usually deals with multiple stakeholders. Davenport's [26] simplified ES description includes the business functions and different stakeholders on a very general level. The actors are managers and stakeholders, suppliers, customers, and employees. Stakeholders refer to shareholders and other similar actors. Sathish et al. [13] extend this by adding vendors as stakeholders because of the trend of choosing pre-packaged ES.

Dittrich's et al. [11] study on ERP customization ecosystem focused on interplay between different internal and external stakeholders. The stakeholders were ERP provider, ERP implementation consultancy and implementation site. This indicates that the axis of organizational entities should be extended to include consultancy as separate entity [see e.g. 33]. Dittrich et al. [11] also suggest that external organizations should be further dissected. The vendor organization has both framework and application developers. Framework developers focus on the vendor's internal issues while application developers are in contact with consultancy. In long-term cooperation especially, it is possible for the developers work directly with the customers. Consultancy entity is further divided into customization and organizational implementation function where the former communicates with vendor and the latter with the implementation site, more precisely local designers. Local designers communicate within the customer organization and its actual end-users [see also 9]. Parts of source code modification can be done as in-house software unit [31]. This further strengthens the local designers' role. In technical sense, the integration with other organizational IS indicates that there is a need for expertise in certain technology areas. Thus, in addition to permanent IT staff, also contract IT staff could be used to tackle this issue [9]. End-users have much bigger role in ERP projects than in traditional systems development [33].

Sarker et al. [32] introduce yet another addition to external stakeholders by making a distinction between global ERP provider and their local partners actually delivering the system to the customer. Yet this view is not highly relevant since usually the local partner and ERP implementation consultancy may be the same actor. In this case, however, the notion of global provider actually expands to the vendor entity. In packaged software industry, the growing number of organizations forms alliances or partnerships in order to increase the value co-creation [32]. This indicates that also the vendors' business management should be included as stakeholder.

There are also different stakeholders within the implementation organization [26]. Rather than just naming them simply as employees and managers, different functions and roles need to be acknowledged [c.f. 34]. For example, it is common for ES projects to have an executive steering team or a steering committee being responsible for the overall project, and reporting directly to the top management. Also project champion could be identified [9]. Project champion is usually from executive level and is in charge of ensuring the adequate resources. In most cases, a specific project team is appointed. Its members are usually selected from different functions. Also a specific project leader can be appointed [9]. In ES projects, the most important departments are different business units and IT department. Business unit can further be divided into managers and end-users as well as IT department into managers and technical staff members [9]. Elbanna [31] adds complexity of internal stakeholders by stating the problems related to multiple projects and their possibly contradicting goals and competition for organizational resources [c.f. 35].

Since the scope of ES system extends over the organization's boundaries [26;21] it is obvious that both business customers and suppliers are stakeholders in development ecosystem [9]. For example, if ES involves extranet function the customers and suppliers can have direct connection to the system, making them both relevant stakeholders. Also different authorities or government agencies are stakeholders [9]. For example legislation sets certain rules for accounting and health and security issues [36;30].

To conclude, ES development is not something that happens in a void, it reaches out both in horizontal and vertical direction making it a complicated network of stakeholders. In other words, different stakeholders are not isolated from each other but they are tightly intertwined [13;30]. This is illustrated in Figure 2. Connections between stakeholders are shown only when they are unambiguous. Note that every actor is not depicted in every context; the point is to outline an extreme example.

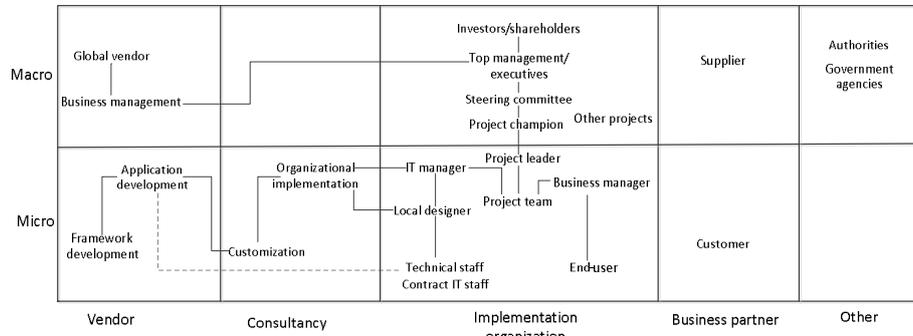


Fig. 2. Stakeholders from ES perspective

## 5 Business process reengineering perspective

BPR is, above all, a business initiative [17]. It receives input from organization's vision and strategy. BPR aims to fundamental rethinking and radical redesign of processes in order to achieve improvements in the organization's performance [18; 19]. The underlying focus on business processes instead of single function, product, job or service stresses the need to consider multiple stakeholders inside the organization. The focus on cross-functional process and the role of IT also implies a connection between IT and business domains on operational or, in the light of initial framework, on micro level. Since the focus is on ERP development ecosystem, only the pre-implementation phases of BPR are under scrutiny [see e.g. 18;37].

In BPR, different stakeholders need to be identified. This enhances understanding on the problem's complexity, and appreciates the views of different people. This emphasizes stakeholder analysis before redesigning the processes [38]. Further, knowledge sharing between the stakeholders is argued to have a positive impact on BPR [39]. This makes communication between internal and external stakeholders as a BPR success factor [40;41;42].

The stakeholders identified in the BPR planning phase include top management, functional executives, IS executives and external consultants [10;43]. Particularly the top management involvement and support, and a strategic view on the whole process are seen critical for BPR success [15;40;41]. This underlines the role of CIO and his/her office as an essential reengineering actor [38;44]. BPR literature also proposes an executive steering team or a steering committee to be used in projects [24;43;45]. It usually consists of the abovementioned executives and consultants, reengineering team member and additionally HR representation [38]. The steering committee's position is between top management and business and IT units. In some cases, the project manager or BPR leader is an alternative actor as a single contact point between the executive level and individual business unit [15;25]. Another significant BPR role is the business process owner who is responsible for the overall process. This argues from his/her inclusion in either reengineering team or steering committee.

Using outside consultants in BPR especially in planning phase is suggested [46]. Yet all decisions must be made within the organization [47]. Ranganathan and Dhalival [43] observe that the consultant's role also vary, ranging from vendors as external consultants to strategic management consultants and IT management consultants. Wastell et al. [38] added another type of consultants, a specific BPR consultant which would be a part of both steering group and reengineering team. These suggest that the consultant organization should be included in the initial framework, and that domain should be further divided into sub-actors.

BPR definitions also extend beyond the organizational boundaries by including suppliers and customers, and redesigning the business networks [21;22;48]. Especially customer focus has been reinforced [see e.g. 15;42]. As benchmarking is often considered as a built-in part of the BPR project [42;46], it is often done in cooperation with software vendors, alliance partners or competitors. They all have an effect on the BPR project. Hence business partners and competitors could have a role in the network. Similarly trade unions and government organs are stakeholders particularly in public sector [10]. Yet their role is seen mainly as guideline providers and regulation setters, and not actually participating. Still, according to our previous definition, they should be viewed as stakeholders. This is emphasized with trade unions whose roles are significant because usually BPR includes downsizing or restructuring [15;49].

BPR efforts need be initiated top-down in order to gain adequate economic and political support [39]. Still all organizational levels should be included [49]. This points out that the network within the organization should be included.

BPR projects often presume a multi-discipline team [17;37;45]. This team may be composed of technicians, managers or consultants, all having knowledge and expertise of different areas [50]. The communication between reengineering team and steering committee and within the reengineering team is considered important [45]. Alternative BPR project organization comprises a functional team, a technical team and a management team. In addition, a system management group acts as a buffer between the user community and the vendor technical support [24].

BPR project stakeholders include many different functional business units, such as accounting, manufacturing and logistics [18;42;51]. Usually the business unit's manager is included in the reengineering team. Similarly Human resources (HR) should be represented in the planning phase, as a member of the reengineering team [38]. Although HR could be seen as one of the business units, it is vital for success and differs greatly from other business units that it should be considered as a separate actor in the development network. This viewpoint expands the initial framework by adding it some depth. Yet it does not bring in any new horizontal actors, since no distinction between different business units can be made at this point. Nevertheless, this makes the network structure more complex.

User involvement in BPR planning phase has been emphasized. Davenport and Stoddard [17] suggest that operational level employees, the ones actually doing the redesigned work, could design the more detailed process activities and flows. This stresses the need for vertical cooperation so that individuals at operational level should also be included in the reengineering team as practice representatives [38]. Altogether, one of BPR main goals is to increase the empowerment of the employees

[18;41] implying intensive user involvement. Still, very few studies have reported views of the organization's employees on BPR [45;52].

The main causes for BPR project failures is said to be the attempts to change too many processes at the same time, or the confusion of BPR with other improvement programs [17;53;54]. Consequently the relationship between BPR project and other improvement initiatives, with shared resources or conflicting goals, need to be considered at least as indirect stakeholders.

To summarize this wide range of BPR stakeholders equips us with broader understanding about this strategic initiative and its focus is on cross-functional processes. The expanded framework from business perspective is shown in Figure 3 below.

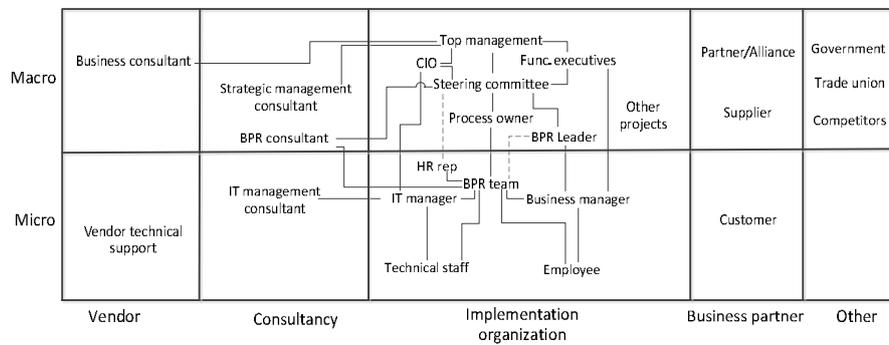
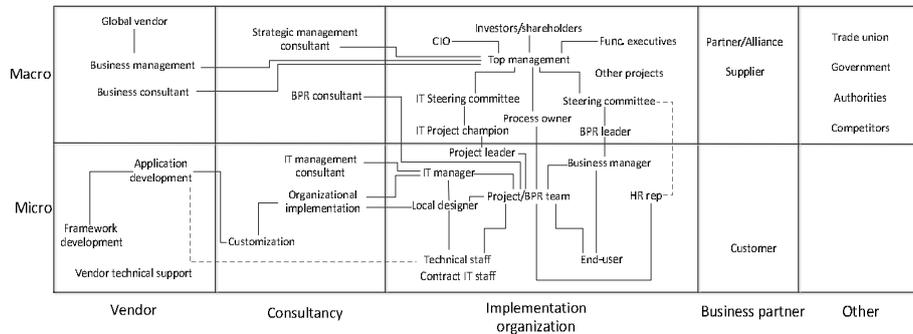


Fig. 3. Stakeholders from BPR perspective

## 6 Discussion

ES and BPR perspectives together create a more accurate framework. It is illustrated in Figure 4. Some of the stakeholders are common to both ES and BPR perspectives, and are combined to clarify the framework. Although the same stakeholders appear from different perspectives, this kind of common view adds some complexity to the relationships between the stakeholders. Consequently every connection is not illustrated in the framework and some stakeholders play multiple roles. For example a business unit manager is usually a member of reengineering and IT project team. This makes the network even more complicated and stresses the need for a holistic view.



**Fig. 4.** Combined framework of ERP development ecosystem stakeholders

Inspection of the framework points out few interesting issues. First, the sheer number of actors and levels in the ecosystem highlights the need for control and management since the possibility of errors and misunderstandings increases exponentially. In same sense, the framework indicates that there are multiple communities of practice in the ecosystem. This implies that different methods are needed for communication and seeking of mutual understanding. Second, the framework asks for cooperation between micro and macro levels of the implementation organization yet it should be done also within other entities. Since most of the entities are interconnected certain ripple effects might cause problems. For example if the vendor organization's application developer's conception of the whole is not in line with the business consultant's conception the overall alignment in the ecosystem suffers i.e. the gap between micro and macro levels drifts also into other organizations. Finally, business partners and other entities are loosely presented in the framework even though their impact on the overall has been stated earlier. For example supply chain partners or customers might be a part of the development project and their needs should then be communicated all the way to the vendor.

Combined framework illustrates how many of the same organizational players are involved in both IT and business development projects. In other words, the framework clarifies that either in case of ES or BPR project stakeholders and projects are interconnected and cannot function in a void. According to Elbanna [31], "the perception of an IS project as a network provides a dynamic, flatter view of IS project innovation and its management structure". This further stresses the notion that multiple project issues, for example struggle over power and resources, should be taken into account. In practice the framework could be used for detecting other entities and potential rivals and collaborators [31]. Additionally it could be used to identify boundaries between different communities of practice.

The underlying idea behind the paper is business-IT alignment. Although it is not explicitly articulated, strategic alignment consists mainly the same set of actors as ERP development ecosystem. Especially in a typical line organization the set of stakeholders largely overlap with SAM stakeholders. It seems that functional integration on internal, micro level is not profoundly explored in the alignment research, since it mostly focuses on strategy level [7]. Alignment should ideally reach tactical and operational levels, including individuals there [1;6;56]. For example, Soh et al. [33] notice that the industry best practice reference models are on too high level

for the implementation organization to effectively assess the ERP system's effect on processes. Our framework thus allows us to analyze the micro level relationships between the stakeholders.

On strategic fit perspective, SAM requires coordination between external and internal domains. This implies the need for cooperation between operational function such as IT department, strategic level such as IT management, and external stakeholders such as technology vendors. On micro-level this indicates that there are various actors involved in decision making as outlined in our framework. The external alignment should also extend the organization's reach and include crucial partner organizations such as customers and suppliers [57;58]. Often IT strategy modifications follow changes in the customer or vendor requirements [56].

Our framework adds depth to SAM by explicitly describing the potential individuals and groups involved in overall alignment process. This could be further developed by mapping the identified stakeholders into SAM. Yet, it should be noted that alignment is a continuous process which evolves over time. This makes the creation of exhaustive framework challenging.

Social alignment is linked to people and individual attributes, such as cognition [7;62], which is where our framework could be valuable. Research on social dimension of alignment usually focuses on relationship between business and IT executives e.g. CEO and CIO [6;62]. Very few studies [c.f. 61] have taken communication between business and IT people on all organization levels into consideration [62]. Above issues derived from our framework strengthen the need to study social alignment, not only on executive level but on other organizational levels too. Kashanchi and Toland [61] define that "the social dimension of alignment focuses on people within an organization". Our framework thus extends that definition by pointing out the relevancy of external stakeholders. Thus, not only the mutual understanding between business and IT on all organizational levels needs to be noticed but also external entities and intra-organizational stakeholders should be taken into consideration.

Analyzing the stakeholders in ES or other inter-organizational IS development opens up possibilities to highlight issues that other, more narrow, approaches often neglect [30]. For example, our framework could be used to structure the complex ERP development ecosystem. The framework could also be a starting point for a systematic literature review. Literature review could point out gaps by exploring literature on identified relationships. Since the perspectives only discuss certain part of the framework, we underline the need to consider all of them together, at the same time.

The framework can be used together with many different theoretical approaches to help the composition of initial understanding of the situation. For example stakeholder theory could be further used to evaluate whether some stakeholders require special attention [13]. Learning Network Theory (LNT) could be utilized to explore roles of stakeholders and their interaction in creation of ES/project knowledge base [59].

Most BPR initiatives are considered as sociotechnical phenomenon with significant political component. This explains why relationships between different actors should be taken into account. Sidorova and Sarker [10] suggest that Actor-Network theory (ANT) may provide a tool for richer understanding of complexities involved in BPR

projects. Since the need for a holistic view, the ANT could also be utilized in further investigation of the proposed framework. We contribute that kind of studied by explicitly articulating the stakeholders and their potential roles in the ERP ecosystem.

Also vendor's perspective in ERP projects is little studied [36]. For the development of new software or IT capabilities organizations engage in strategic alliances and joint ventures with the vendor [3]. It should be noted that in such situation vendors still usually have different interests than the implementation organization and possibly own goals and targets [10;30;36]. This might be the case especially when vendors are developing their own product at the same time. Our framework allows taking vendor or consultancy organization as a starting point.

## **7 Conclusions**

Main contribution of this paper to research is to provide a framework which combines technology and business views of stakeholders in ERP development ecosystem. It offers a better understanding of the examined concepts and their relationship. Also the need for future research to extend the social dimension of alignment is indicated. In empirical research our framework could be utilized in pinpointing different problems and gatekeepers in ERP development ecosystem. The role of business partners could be studied further since they have an impact on IT strategy and from that further to ES and BPR projects [55].

For IS practice our framework, above all, highlights the multitude of stakeholders and organizations involved in ERP development networks providing more holistic view. As a practical implication, both implementing organization and vendor should critically assess own goals and objectives and compare them against each other to see possible conflicts. The importance of communication within and inter-organization has been stressed. Also the issues regarding multiple project environments should be taken into account in development.

Our study has its limitations. For example, the framework is based on an idea of larger line organization or an organization alike. This means that, for example, smaller project-based or expert organizations are left out. Yet we believe the framework is a valuable starting point also in those situations. Secondly, the literature used in this work was not collected systematically. Neither was the method in any way exhaustive nor did it represent all existent literature. This means that we, by all means, do not claim that the framework is comprehensive. It is rather the first attempt to construct it.

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