Inter-Organizational alignment with e^3*alignment*

Vincent Pijpers

Free University, FEW/Business Informatics, De Boelelaan 1083a, 1081 HV Amsterdam, The Netherlands. (v.pijpers)@few.vu.nl.

Abstract. In this paper the e^3*alignment* framework is presented. The e^3*alignment* framework is designed for alignment *between* organizations operating within a value web, which is also known as inter-organizational alignment. The e^3*alignment* framework focuses on the *interaction* between these organizations to create alignment. In addition, e^3*alignment* considers *four* different types of interaction. To analyze and trace changes over these types of interactions, various conceptual modeling techniques are utilized.

1 Introduction

Business-IT alignment is a broad concept [4], but in general the improvement of coherence between business processes and information systems is meant. To do so, the first condition is that there is alignment within the business and IT them self. So business-IT alignment is not only improving coherence *between* business and IT, but also *within* both business and IT [5]. In addition, business-IT alignment is traditionally more concerned with the alignment within a single organization. However, nowadays organizations increasingly operate in value webs, in which multiple organizations cooperate to meet complex customer needs [14]. Yet, for these value webs to be successful, the organizations need to be properly aligned [6, 18]. For organizations participating in a value web, I argue with the e^3*alignment* framework that we need to focus on the *interaction* between these organizations to create inter-organizational alignment. I reason so, since one of the success factors of a value web is that *each* actor involved should be able to make a sustainable profit, and does so by interacting with the other organizations in the value web, e.g. by exchanging objects of economic value [6].

The e^3*alignment* approach takes *four* different perspectives on "interaction" into account, since there is no single type of interaction (e.g. information exchanges and economic value transfers are different kinds of interactions). By doing so, we also separate concerns. In other words: per perspective, e^3*alignment* focuses on one specific type of interaction. Separating concerns is well-known in the field of requirements engineering (see [10]). In e^3*alignment* the following perspectives are taken on interaction: 1) a *strategic* perspective, to understand the strategic influence of organizations on other organizations; 2) a *value* perspective, to understand the things of economic value exchanged between the organizations in the value web; 3) a *process* perspective, to understand the order

and activities behind the interactions; 4) an *IS* perspective, to understand the IT enabled exchange of information between organizations.

By focusing on interaction, e^3*alignment* takes an external view on alignment, or *inter-organizational alignment* [5]. Inter-organizational alignment is concerned with the alignment *between* actors within a value web. In contrast, an internal view on alignment, or *intra*-organizational alignment, focuses on the alignment within a single organization [5], which is the main concern of most traditional business-IT alignment frameworks (e.g. [7]). The e^3*alignment* approach includes both forms of business-IT alignment: (1) alignment *within* one of the perspectives on interaction, which is concerned with aligning interactions between actors as seen from a single perspective [5]; (2) alignment *between* two, or more, of the perspectives on interaction, which is concerned with alignment *between* perspectives [5], for instance between the value and IS perspective. Creating alignment, or *consistency*, between perspectives is well-known in the field of requirements engineering and is a direct result of separating concerns (see [10]).

To actually create inter-organizational alignment a number of steps should be taken, which are based on the requirements engineering cycle (see [15]): 1) alignment problem analysis, in which the alignment problems are analyzed; 2) alignment solution design, in which (alternative) solutions are found; 3) impact analysis, in which the impact of the proposed solutions is analyzed. To actually create alignment these steps should be performed over a number of iterations. Furthermore, I reason with e^3*alignment* that *conceptual modeling techniques* should be used to actually execute the process of alignment. e^3*alignment* utilizes light-weight, yet ontological well founded, modeling techniques. Utilizing modeling techniques enables us to create shared understanding among stakeholders [3], allows for traceability of changes over the perspectives [10], and closely resemble the way-of-working in information system design. The following modeling techniques are utilized: e^3*forces* [11], e^3*value* [6], UML Activity Diagrams [2], and IS architectures [17].

The paper is structured as follows: First, research problems will be discussed. Second, the e^3*alignment* framework will be presented. Hereafter, the relationships between the perspectives on interaction will be discussed. The paper ends with lessons learned, in which we reflect on the practical usability of e^3*alignment*, identify future research directions and present conclusions.

2 Research Approach

Companies are increasingly participating in *value webs*; these are sets of organizations which collaborate to jointly satisfy a complex customer need [14]. Recently, Chan and Reich [4] published an article summarizing and analyzing over 150 articles concerned with aligning business and IT in organizations. However, most of the work identified by Chan and Reich [4] on business-IT alignment focuses just on alignment concerns within *single* organizations, neglecting the environment in which these organizations operate. To this end, I argue that alignment issues also exist between *multiple* enterprises. Subsequently making

the overall research question: how to achieve business-IT alignment between multiple organizations? Furthermore, among the directions for future research, discussed by Chan and Reich [4], was "examining the process of alignment". Part of such a alignment process is the *exploration* phase in which alignment issues are elicited and (alternative) solutions are considered for improving alignment [18]. This phase is often referred to as the *early requirements engineering phase*, in which the business context is analyzed to elicit business requirements, which ultimately are satisfied by information systems [6, 18]. Subsequently the specific research problem is: How to deal with business-IT alignment issues in such an early phase, characterized by limited availability of information about the case at hand, time constraints, and high uncertainty [13]?

To deal with this specific research problem first a number of exploratory case studies have been performed to determine what (eg. which perspectives) is important to consider in the early phases of inter-organizational business-IT alignment. Furthermore, these case studies were also used to analyze the relationships between the various perspectives. Such knowledge is required to determine if there is mis-alignment between the perspectives. Based on these findings the e^3*alignment* framework and approach were created. Hereafter e^3*alignment* was tested on industrial strength case studies within the Dutch aviation sector and Spanish electricity sector.

3 The e^3*alignment* Framework

To cope with the two aforementioned research problems, we introduce e^3*alignment*. With e^3*alignment* , it is possible to explore a wide range of *inter-organizational alignment* issues concerning the *interaction* between organizations, and their information systems, in a value web, seen from *multiple* perspectives, and with the aid of *modeling techniques*. To understand the philosophy behind e^3*alignment* we present the model in figure 1. The model shows the key features of e^3*alignment* :

- e^3*alignment* is concerned with creating alignment, or coherence, between organizations operating in a value web by focusing on the *interaction* between these organizations (see section 3.1). In figure 1, these interactions are represented by the horizontal lines.
- e^3*alignment* takes four different perspectives on interaction between organizations: a strategic, value, process, and IS perspective (see section 3.2). For each perspective there is a horizontal line in figure 1, representing the interactions considered by such a perspective.
- To understand and analyze each of the four perspectives on interaction, per perspective a conceptual modeling technique is utilized, as stated in the brackets per horizontal line in figure 1.
- Since we take multiple perspectives on interaction, e^3*alignment* creates alignment between organization *within* a single perspective (the horizontal arrows) and alignment *between* perspectives (the vertical arrows in figure 1).

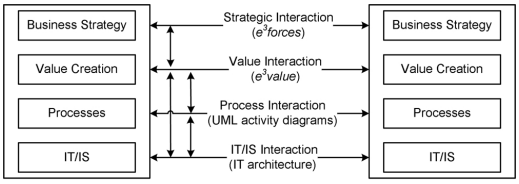

Fig. 1. The e^3*alignment* Framework

We explain the two types on alignment in more detail and with examples in section 4.

3.1 Interaction Between Actors in Networks

Since organizations increasingly operate in value webs [14], e^3*alignment* takes a network perspective on alignment. In essence, a network is a number of nodes which are connected. In both the business and IT literature, nodes are often referred to as *actors*. An actor can be a variety of things, an actor can be an organization, but also an actual person or even a piece of hardware [2].

A second key element of networks is the *interaction* between actors, which is the key focus of e^3*alignment* . Interaction between actors is represented in figure 1 by the horizontal lines. There is interaction between two actors if one actor somehow *influences* the other.

3.2 Multiple Perspectives

Interaction is a fairly generic construct. Furthermore, it has been dealt with in both business and IT literature. Interaction is expressed in business literature ranging from supply chain literature where objects of value are exchanged between actors (e.g. [9]) to strategic literature where actors influence each other on a strategic level (e.g. [12]). In IT literature, interaction is often considered from an information viewpoint where information is exchanged between actors (e.g. [2]) or a process viewpoint where the sequence of interactions is considered (e.g. [16]).

Since various conceptualizations of interaction exist to address various stakeholder concerns, e^3*alignment* separates these concerns by taking different perspectives on interaction. Each perspective analyzes a different type of interaction between organizations. The benefit of separating concerns is that (large) complex issues are reduced in more comprehensible issues, making it easier to focus on the key elements. To cover the wide range of interactions between actors in a network, four different types of interaction are considered in e^3*alignment* (see the horizontal arrows in figure 1):

– The *Business Strategy* perspective, which considers how other organizations influence the *strategic position* of an organization. This type of interaction

is taken into consideration in e^3*alignment* , since it shows how organizations influence each other on the long term.
- The *Value Creation* perspective, which considers how value is created by the *value web* in which the organization operates. This type of interaction is taken into consideration since it shows the things of economic value exchanged between actors in a network to ultimately be able to meet a customer need.
- The *Process* perspective, which considers the cross-organizational *coordination processes* to support the value creation. This type of interaction is taken into consideration in e^3*alignment* since this view on interactions shows the actual physical transfer of objects and takes "time" into consideration, such that the activities behind the interactions and sequence of interactions can be considered.
- The *IT/IS* perspective, which considers information systems and technologies used to interact with the environment to *exchange information*. This type of interaction is taken into consideration since it will enable us to shows which part of the exchange of objects (e.g. information) is facilitated by information technology.

4 Inter-organizational Alignment

4.1 Modeling Techniques

For each type of interaction considered for inter-organizational alignment, a modeling technique is given (between brackets in figure 1). To be able to execute the *process* of business-IT alignment, e^3*alignment* departs from traditional alignment frameworks by actually introducing techniques and methods for creating alignment. The e^3*alignment* approach considers for each type of interaction a specific modeling technique. The benefit of utilizing known modeling techniques is that we can easily create more shared understanding over various aspects of the value web at hand [3]. In addition, we can trace changes over the four perspectives to better understand the consequences of design choices within one of the perspectives [10]. Finally, by choosing this model-based approach, we closely resemble the way-of-working in information system design, so the models developed provide a suitable starting point for further design and implement ion of the information systems needed to enable the value web. The following modeling techniques are utilized:

- e^3*forces* for the strategic perspective, which shows from a strategic perspective how organizations influence the value offerings of other organizations [11].
- e^3*value* for the value perspective, which shows what of value is exchanged between actors in a value web to meet customer needs [6].
- UML activity diagrams for the process perspective, which shows the coordination process and activities executed to enable the value creation [2].
- IS architectures for the IS perspective, which shows the exchanges of information and data between various information systems [17].

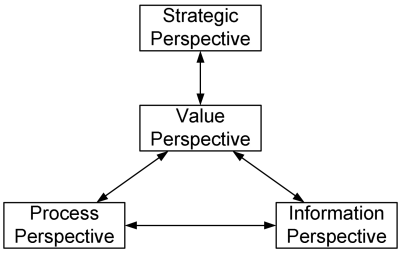

Fig. 2. Relationships between perspectives

4.2 Alignment within a perspective

This type of alignment is concerned with the alignment between organizations [5] (the horizontal arrows in figure 1) as seen from a *single* perspective. For instance, to determine if the value web is profitable for all actors (i.e. aligned), we need to analyze the value perspective only. Thus, for this type of alignment only *one* conceptual modeling technique is taken into consideration.

4.3 Alignment between perspectives

Inter-organizational alignment *between* perspectives is concerned with the alignment between two perspectives on a value web. Three relationships are considered (see Fig. 2). The relationships between strategy and process/IS perspective are not considered since these are traceable via the value perspective. Furthermore, the relationship between process and IS perspective is not considered since a vast amount on this relationship is already present and no clear contribution would be made.

Strategy and Value Perspective. The relationship between the strategy and value perspective can be best described as direct financial effect versus long term effects (eg. switchings costs, partner dependency, etc.). In the value perspective the exchange of value objects for money is considered, where in the business strategy perspective the long term (i.e. strategic) effects of these value exchanges are considered (eg. price and product configuration).

Value and IS Perspective. Two main relationships between the value and IS perspective can be distinguished: "*structure of interactions*" and "*technologies*". With the *structure of interactions* we mean the lay-out, or composition of actors and their interactions. Field experience and case studies have shown that when the structure of the value web changes the IS structure follows a similar pattern and vica versa. *Technologies* used in the IS perspective partially determine the actors and value exchanges in the value web, since new technologies often result in new objects (which might be valuable) and new processes. For instance in the case study at hand, if new wireless technologies are used to communicate with ground personnel it might increase their efficiency or lead to new or improved services, thereby creating more value.

Value and Process Perspective. The relationship between the value perspective and process perspective is best described as conceptual vs. physical. In a value model conceptual exchanges of value are modeled. In a process the physical delivery and execution of these exchanges are modeled. To this end the same actors are present in both models [16], since a new actor would imply additional value exchanges and thus also additional processes. Furthermore, the conceptual exchanges in the value model are somehow represented in the process model [16].

5 Lessons Learned

Case studies at starting Internet companies, the Dutch aviation industry and Spanish electricity industry have shows that by incorporating modeling techniques into the e^3*alignment* framework we were able to actually find mis-alignment, easily trace the effects of possible solutions over the perspectives and create alignment between the organizations and their interaction. Our second claim was that we needed to consider four types of interactions. First of all, by considering four perspectives we believe that the areas where alignment issues can occur and where solutions need to be found are covered. As was found in the various case studies performed. Although it must be noted that not always all perspectives were relevant for the stakeholders, commonly one or two perspective were not (yet) taken into consideration.

6 Related Work

A focus on inter-organizational alignment via multiple perspectives is also found in [8]. However, in comparison to e^3*alignment* , only the value ("management"), process ("administration") and IS ("IT") perspective are considered, strategic implications are not considered. Furthermore, a top-down approach, starting with the value perspective, is taken into account, while in e^3*alignment* each perspective can be the starting point for inter-organizational alignment. Another related early phase requirements approach is TROPOS [1]. However, TROPOS focuses on software development and less on the business-IT alignment. Furthermore, TROPOS mainly takes "actor goals" into account and for instance does not consider value creation.

7 CONCLUSIONS

With e^3*alignment* we intend to explore a wide range of *inter-organizational alignment* issues concerning the *interaction* between organizations in a value web, as seen from *multiple perspectives*, and with the aid of *modeling techniques*. Various case studies have demonstrated that we are able to rapidly, yet correct, explore the alignment issues at hand, both within single perspectives as between multiple perspectives. Furthermore, we able to explore various solutions and understand there impact on the interactions between the organizations in the value web.

Acknowledgments This work has been partly sponsored by NWO project COOP 600.065.120.24N16.

References

1. TROPOS, 2008. www.troposproject.org/.
2. UML 2.0, 2008. www.uml.org.
3. W. N. Borst, J. M. Akkermans, and J. L. Top. Engineering ontologies. *International Journal of Human-Computer Studies*, 46:365–406, 1997.
4. Y. E. Chan and B. Horner Reich. It alignment: what have we learned? *Journal of Information Technology*, (22):297–315, 2007.
5. Zs. Derzsi and J. Gordijn. A framework for business/it alignment in networked value constellations. In *Proceedings of the workshops of the 18th International Conference on Advanced Information Systems Engineering*, pages 219–226. Namur University Press, 2006.
6. J. Gordijn and H. Akkermans. E3-value: Design and evaluation of e-business models. *IEEE Intelligent Systems*, 16(4):11–17, 2001.
7. J. Henderson and N. Venkantraman. Strategic alignment, leveraging information technology for transforming organizations. *IBM systems journal*, (1), 1993.
8. C. Huemer, P. Liegl, R. Schuster, H. Werthner, and M. Zapletal. Inter-organizational systems: From business values over business processes to deployment. In *Proceedings of the 2nd International IEEE Conference on Digital Ecosystems and Technologies*. IEEE, 2008.
9. G. Johnson and K. Scholes. *Exploring Corporate Strategy*. Pearson Education Limited, Edinburgh, UK, 2002.
10. B. Nuseibeh, J. Kramer, and A. Finkelstein. A framework for expressing relationships between multiple views in requirements specification. *IEEE Transactions on Software Engineering*, 20(10):760–773, 1994.
11. V. Pijpers and J. Gordijn. e3forces: Understanding strategies of networked e3value constellation by analyzing environmental forces. In *Proceedings of the 19th Conference on Advanced Information System Engineering 2007*. Springer, 2007.
12. M. E. Porter. *Competitive advantage. Creating and sustaining superior performance*. The Free Press, New York, NY, 1980.
13. J. Schumpeter. *The Theory of Economic Development*. Harvard University Press, Cambridge, Mass, 1934.
14. D. Tapscott, D. Ticoll, and A. Lowy. *Digital Capital - Harnessing the Power of Business Webs*. Harvard Business School Press, Boston, MA, 2000.
15. R. Wieringa, N. Maiden, N. Mead, and C. Rolland. Requirements engineering paper classication and evaluation criteria: a proposal and a discussion. *Requirements Engineering*, 11(1), 2005.
16. R. Wieringa, V. Pijpers, L. Bodenstaff, and J. Gordijn. Value-driven coordination process design using physical delivery models. In *Conceptual Modeling - ER 2008*, volume 5231/2008, 2008.
17. R.J. Wieringa. *Design Methods for Reactive Systems*. Morgan Kaufman Publishers, San Fransisco, CA, 2003.
18. E. Yu. Towards modelling and reasoning support for early-phase requirements engineering. In *Proceedings of the 3rd IEEE Int. Symp. on Requirements Engineering (RE'97)*, pages 226–235, 1997.