AGILE CORPORATE NETWORK MODELING WITH BUSINESS SYSTEMS ENGINEERING

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Abstract: Corporate networks are highly complex systems. To gain a competitive advantage corporate networks have to be stable but also flexible enough to react on changing market situations. An approach in increasing the ability of a corporate network to operate in this manner is to make it agile. Due to the increased relevance of ICT in business processes possible negative influences of ICT on business strategies can be noticed. Business systems engineering is a management approach which avoids this feedback effect.

Key words: corporate networks, agile behaviour, business systems engineering.

1. Introduction

In the recent years networks between companies, implying cooperation, and the interaction of these networks have received increasing attention from policy makers as well as from scientists. In the early 90’s the focus was on process optimization and reengineering, currently the latter frequently focuses on them in an attempt to create industrial cooperation, better integration and communication along the value chain.

The University of Applied Sciences Joanneum, department of industrial management, is researching in the field of corporate networks and has a focus on the use of information technologies in that area. This paper will show up analyses of different corporate cooperation forms identified by the Joanneum research group.

The University of Applied Sciences CAMPUS02 Graz, department of information technologies and IT-marketing, has a research focus on influence factors and possible negative feedback effects in the three-way dependences of corporate strategy, corporate processes (management-, business- and support processes) and information and communication technologies (ICT) used in a business environment.

\[\text{\footnotesize\textsuperscript{(1)} A value chain is a chain of activities. It is a concept from business management that was first described and popularized by Michael Porter 1985.}\]
The CAMPUS02 research group is examining the prediction of Gartner Consulting Group\textsuperscript{2} analysts who state that information technology is a key factor in enabling strategies: Processes will no longer be independent from ICT. Gartner predicts a “move to real-time and process-focused IT infrastructure” and declares that the upcoming linking possibilities of business strategy changes to infrastructure change in a framework of strategic change management will emerge a new discipline called business systems engineering.\textsuperscript{3}

This top down approach (strategy builds processes, processes enabled by ICT) combined with the management model of business systems engineering by Gartner Group is a possible approach in improving the behaviour of the network in terms of agility. How this will be realized is explained in the following Sections.

2. Networktopologies

“The classic borders of companies become more and more blurred, because the acting of companies changed. They are not isolated any more… they are now modular, fragmented decentralised objects which are need cooperation and more autonomy.”\textsuperscript{4} Picot describes a trend according to this classic company organization have served its time and have been replaced by new Organization forms like modular organizations, networks, virtual organizations or cooperation.\textsuperscript{5} Porter argues, from a business strategy perspective networks are more successful when they are linked horizontally and vertically with companies in related and supporting industries. Deduced from this a crucial success factor for these cooperate networks is the IT and process integration along the value chain. In the last years the business researches are focused on the subject of industrial networks. Out of the huge number of boundless cooperation possibilities thereby several corporate network typologies arisen. As shown in the following figure and based on \textit{Duschek/Rometsch} following typological differentiation of industrial networks in following dimensions made (fig.1):\textsuperscript{6}

\begin{itemize}
  \item explorative or exploitative
  \item hierarchical or heterarchical
  \item stable or dynamic
  \item regional or international networks
\end{itemize}

In the explorative network the focus is on performance maximization and the development of synergy effects in networks. In contrast to that the exploitative network is cooperation for research and development of new products in the centre of inter-organisational arrangements.

In Hierarchical network cooperation a focal company, which is the core company in the network organization, fulfils the steering and leading tasks. The principle of the heterarchical network is based on self organisation.

For long term collaborations stable networks are used. In this cooperation type trust and reliability are important key factors. In contrast to that, dynamic networks are used in short term relations. For example when companies only cooperation during a project.

\textsuperscript{2} Gartner Consulting Group, \url{http://www.gartner.com}
\textsuperscript{4} Picot et al. 2001, p. 2.
\textsuperscript{5} Sydow 1992, p. 80-81.
\textsuperscript{6} Duschek/Rometsch 2004, p. 1. and Sydow et al. 2003, p. 49
All these previously mentioned network types can be regional (locally) or international.

![Diagram of network typologies]

**fig. 1: Overview about the different network typologies.**

All network types do have three common basics: Corporate networks are operated through a specific strategy, with defined processes and information and communication technologies (ICT) which are suitable to help these networks operate. One must consider that in a competitive business environment, adaption speed on changes is a key to keep market shares. The next section shows up how agile system behaviour is a possible answer to face this challenge.

3. Agile behaviour in a system

As described in Section 2 the efforts in building and operating corporate networks lie in stability but also dynamic. These behaviours can be reached with agile methods. To give an insight on agility and agile behavior the term agility in relationship with systems will be declared:

A corporate network as described is characterized through the fact, that it is a system with several characteristics. It is a socio-technical system (complex human-machine relations), a socio-political system (different companies are connected with their company cultures) and also a socio-economical system (the network partners are parts of a common supply chain). Due to those characteristics corporate networks can be stated as very complex systems and the buildup and the operation processes are highly challenging. Nevertheless corporate networks have to be adaptive and flexible enough to react on business environmental changes quickly to avoid the loss of competitive advantages.

Furthermore Haberfellner and de Weck identified the key factors to engineer agile systems. To engineer agile systems three elements are required:

- A decision mechanism by which the benefits and costs of system adaption are compared and system state changes are triggered.
- Necessary flexible elements inside the system that allow it to be changed easily and quickly.

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7 Fricke et al. 2000, pp.169-179
8 Haberfellner/de Weck, 2005, p. 2
c) A set of sensors to monitor external attributes to alert decision makers when changes might be warranted.
The next section will give a lookout on the business systems engineering model by Gartner Consulting group and will show up how agility in complex systems like a corporate network can be established and how the business systems engineering approach is a possible key in reaching this goal.

4. Business Systems Engineering

The CAMPUS02 research group does have a focus on information technology as enabler of corporate strategy endeavours:
The usual business engineering top down process is in defining a corporate strategy, then deducing the processes and finally examining the suitable ICT to enable the processes (fig. 2).

fig. 2: Business Systems Engineering Top Down Process

Unfortunately ICT not always fits the requirements of the business processes in terms of mapping them in an appropriate way. This might be due to the fact that the available ICT is not mature enough or the processes are too complex. The effect on this situation will result on strategy feedback behaviour: ICT influences the process by adapting them (changing them) for the ICT assignment; the adapted processes in turn influence the strategy (fig. 3).

Business Systems Engineering is the management approach which is aware of this feedback effect and does lay the engineering efforts on all three components (strategy, process, ICT) to avoid this problem.

fig. 3: Influenced strategy through inapplicable ICT

In context 3 of this paper the three elements which are enabling agile systems were described.
In context with the business systems engineering approach this can now be seen as followed:
Regarding the decision mechanism by which the benefits and costs of system adaption are compared and system state changes are triggered: This is a task of the strategical management which has to be aware of the network strategy and of the partner strategies regarding their participation in the network.
Regarding the flexible elements inside the system that allow it to be changed easily and quickly: This can be defined and stated through detailed process descriptions of all partners and of the corporation network.
Regarding the set of sensors to monitor external attributes to alert decision makers when changes might be warranted: This can be fulfilled by implementing suitable ICT which is committed by all partners and is able to support the networks processes.
Business systems engineering is able to support agile behaviour through its demand in using real-time and process-focused IT infrastructure to link business strategy (business strategies of all network partners) change to infrastructure change. In making the three components of strategy, process and ICT more flexible the system at all shows a better agile behaviour.

The whole proceeding in creating and running (operating) a corporate network can be described as followed (fig. 2):

The corporate network always is appointed by certain corporate shared needs and a goal of shared (and also individual) added values which fosters companies to work together. The business systems engineering model can be used in the phase of establishing but also in the phase of operating the network:

- Step 1 is to define the corporate strategies regarding their needs of the network and the networks strategy to the external stakeholders.
- Step 2 is to deduce the internal processes (support-, business-, management processes) which connect to the network and to identify the network processes which have no connection to the network partners but are also necessary to operate (support-, management processes)
- Step 3 is to deduce the suitable ICT framework which enables on one hand the partner processes and on the other hand the common network processes.

**fig. 4: Business Systems Engineering at level Corporate Network**

1. Adoption of strategy

As stated in section 3 the item “decision mechanism” will be handled with strategical methods operated by a (common) strategical management. All network partners efforts have to be bundled in the finding of a common network strategy: This strategyfinding process is highly complex due to the reason, that all corporate network members run also their own individual business strategies. In order to strengthen the network all network partners have to agree on a strategical decision mechanism so that system state changes are triggered fast enough. The goal of an efficient strategy decision mechanism is to increase the competitive advantages of the network; this may be done by network adaption if necessary. The networks ability to operate with suitable strategical decision mechanism is a key to agile behaviour.

2. Adoption of processes
The common way in describing processes is done with the help of macromodel and micromodel designing. The designing of a macromodel supports the business (re)engineering in showing the workflows of business processes which implement the strategy. The micromodel shows up how the operative fulfillment of business processes is done. In an corporate network the partners of the network are taking over parts of the whole value chain (see fig. 5). It is essential that not only the business processes but also the interfaces between the business process steps which are gapping company boarders are well described.

**fig. 5: Example of a network process macromodel**

As stated in Section 3 flexible elements inside the system that allow it to be changed easily and quickly are able to increase agile behaviour. In a corporate network these flexible elements are given through the business processes in the value chain. Agile behaviour can be increased through excellent business process engineering at this stage.

3. Adoption of ICT

Ahead of the analysis of the interorganisational Information systems (IOIS), a classification between technology-, application- and concept solutions has been made. After an analysis of the state of the art literature following parameters have been defined:  
- **Topology of the involved systems**: multilateral (m:n) and bilateral (1:1, 1:n) system (application) connections.
- **Function**: The system can be used for only one department (function dependent (sales, marketing, research, production) or can be used in different departments (cross functional).

These categories have been expanded with following categories:
- **Degree of implementation**: based on Tschandl/Ortner and Oesterle a distinction between horizontal (process layer) und vertical (management layer) integrations deepness is made.
- **Process/application/data**: The hierarchical layer of the IT-solution for the process overlapping information exchange.
- **Information flow**: The transactions- (consists of various operations) or message based (every event causes a message).
- **Integration effort**: how complex and expensive the integration of the IT-solution(digressive and progressive costs).

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9 Gadatsch 2008, p. 65
10 Tschandl/Ortner 2004; also Silberberger 2003, p. 21.
EDI und EAI particularly is suitable for the usage in stable and long term corporations (for example in strategic and regional networks). Most of the applications have a tendency to middle and high process orientated horizontal integration and that’s a precondition for the integrated information exchange. Due the fact that SCP- and ERP-systems have a permanent linking, they are predestined for stable networks. ERP-Systems are primary used for intraorganisational systems As multilateral Application Groupware systems are in general particularly suitable for network cooperations.

Information and Communication Tools are not solely used for the implementation of processes but also to support the decision finding process for the strategical management (identifying weak signals). In that manner ICT operates a sensor which helps monitoring external attributes to alert decision makers when changes might be warranted. So ICT becomes a key role not only in enabling processes but also in supporting the strategical management in the decision finding process and helps to increase the agile behaviour of the whole system (network).

5. Conclusion

The regular business network creation top down approach helps to make the contribution of every company to the common network visible. Advantages of this proceeding:

- Transparency within the network
- Faster selection of a new partner in case of drop out of a network partner
The business systems engineering approach goes one step further. The used ICT will be checked whether it will support the processes or not: ICT shall enable processes which are following the strategy.
It has to be avoided that the corporate network processes have to be adapted to the available ICT. This would cause a dangerous feedback effect on the corporate strategy and could lead to the loss of the core competences which are expressed by the business processes.

At the layer of corporate network forming a stepwise proceeding in checking the strategy, adapting processes and choosing ICT is a recursive procedure: triggered every time through
- Changing of market situation
- Entrance of a new company to the network
- Drop out of a company from the network

With the described management model the following characteristics may be reached:
- Agility: through well defined processes and ICT which is able to enable these processes quickly
- Transparency within the network: every network partner is informed about the contribution to the network
- Redundancy: in case of drop out of one partner the identification of a alternative is simplified
- Lowering the hurdles for new network partner: new strategical partner are able to check whether their strategy or processes fit the corporate networks needs
- Higher quality in offering products/services: a more complex division of labor production is possible.

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