Autonomous Cooperation-based Business Models

Potentials and Risks for Customer Value Propositions, Added-Value Architectures and Income Models of Logistics Service Providers

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***Abstract*—Autonomous cooperation as an organizational principle is a promising approach for logistics service providers to increase their strategic flexibility. This paper discusses effects that can result from an increase of the amplitude of behavioral options as well as the velocity of behavioral reactions of logistics companies on the components of their underlying business models: The customer value proposition, the added-value architecture and the income model. Thereby, both positive as well as negative potential effects are identified.**

Keywords-Logistics Systems, Autonomous Cooperation, Business Modelling, Strategic Flexibility

I. INTRODUCTION

In order to find strategic positions within the market for logistics services that enable the services provided by logistics companies to be recognized by the customer as special, they have to adjust their underlying business models. These models consist, according to Stähler (2001), of the components value proposition, added-value architecture and income model [25]. One possibility for a strategic positioning with the aim for a differentiation is to offer more individualized services [5] and to be able to react faster on environmental changes than competitors [11]. Therefore, strategic flexibility can be an essential success factor in logistics markets [12, 31]. Following Wycisk (2009), one possibility to increase a logistics service provider's flexibility on both levels is to increase its degree of autonomous cooperation [31]. Autonomous cooperation is an organizational principle, realized through usage of so-called 'smart parts'- technologies [32], that reflects processes of decentralized decision-making of autonomous logistics objects in heterachical system structures [30]. But how does an increase of the degree of autonomous cooperation of the underlying logistics system of a logistics service provider affect its possibilities to alter its customer value proposition, the technological and organizational realization of this proposition and the underlying income models? In other words: how does autonomous cooperation affect the potentials to alter the business models of logistics service providers?

Following this research question, the overarching aim of this paper is to identify potentials and risks that arise from an increase of autonomous cooperation to change a logistics service provider's business model in order to reach a certain positioning within the market of logistics services via an increase of strategic flexibility. Therefore, the paper proceeds as it follows: Section II comprises an introduction of autonomous cooperation for a flexibility-based positioning of logistics service providers. Section III introduces the conceptual framework of business model design, consisting of the three components customer value proposition, added value architectures and income models. Section IV discusses exemplary positive as well as negative effects that an increased strategic flexibility in terms of an increased amplitude of behavioral options and velocity of behavioral reactions can have on these components. Section V will subsume the results and deduce further research requirements.

II. AUTONOMOUS COOPERATION FOR A FLEXIBILITY-BASED POSITIONING OF LOGISTICS SERVICE PROVIDERS

A. Positioning of Logistics Service Providers via Strategic Flexibility

In a modern perspective logistics systems can be regarded as international supply networks [10]. From a system theoretical view [28] logistics service providers are one kind of sub-systems, beside others like manufacturers, retailers or warehousing operators, within such logistics networks [4, 26]. As such, logistics service providers compete with their competitors within the same network as well as within other networks among logistics orders (e.g. transportation of goods from manufacturers to warehouses) [32]. Hence, in order to gain and maintain competitive advantages logistics service providers have to differentiate themselves from their competitors. In order to do so, they need to find a position in the respective market that allows them to be recognized by the customer as a company with special service characteristics [5]. Positioning within a market means to purposefully creating and spotlighting strengths and qualities of the offered service [20].

One dimension of such strengths and qualities is a company's strategic flexibility [1, 3, 12]. According to Burmann (2002) strategic flexibility reflects a company's potential of managerial options, in terms of velocity and amplitude, in order to actively and offensively exploit future potentials to grow through an alteration of the company's services [3]. For instance, strategic flexibility allows in short as well as in long terms offering highly individualized services to customers. This refers on the one hand to the velocity with which a company can alter its service program

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with respect to the customers' demands and its changes over time. On the other hand the amplitude of managerial options for a change of the offered services determines the scope of possible fulfillments of customers' demands [3]. Hence, being strategically flexible is one possibility for a successful positioning of logistics service providers in order to realize a differentiation from competitors. But how can strategic flexibility be achieved and maintained? Wycisk (2009) shows in a causal explanation model how the organizational principle autonomous cooperation can contribute to an organization's strategic flexibility and therewith, finally to an increase of the respective corporate value [31].

B. Autonomous Cooperation as an Organizational Principle

With an ongoing shift in the perspectives on modern logistics systems from linear supply chains to complex, non-linear and highly dynamic supply networks, the idea of autonomous cooperation becomes more and more relevant [10, 30]. The reason lies on the one hand in its potentials to better cope with today's complexity and dynamics of logistics networks than centralized decision-making configurations [30]. On the other hand the underlying idea of self-organizing, artificially intelligent logistics objects becomes more and more realistic in the course of an ongoing development of modern information and communication technologies (e.g. RFID) as well as of associated methods (e.g. collaborative route-planning), and instruments (e.g. multi- agent-modeling) [22]. According to Hülsmann and Windt (2007), autonomous cooperation can be defined as *"(...) processes of decentralized decision-making in heterarchical structures. It presumes interacting elements in non-deterministic systems, which possess the capability and possibility to render decisions. The objective of Autonomous Control is the achievement of increased robustness and positive emergence of the total system due to distributed and flexible coping with dynamics and complexity."* [30, p. 8]. Hence, the following constitutive characteristics can be deduced that define the degree of autonomous cooperation of a certain logistics system and the underlying processes: decentralized decision-making, autonomy, interaction, heterarchy and non- determinism [30].

Interaction describes the exchange of information between system elements via communication processes [24] (e.g. products to be transported inform containers about their desired destinations). **Decentralized decision-making** reflects the ability of the system elements to decide between action alternatives [9] by themselves. **Autonomy** refers to the degree to which the system elements are allowed to render decisions by them selves [30]. **Heterachy** describes system structures in which a permanently dominant system element does not exist [19]. **Non-determinism** finally refers to the resulting unpredictability of future autonomously controlled systems' states even if all system laws are known and current system states can be measured [6].

With recourse to the aims of autonomous cooperation, the question arises, how an increase of these degrees would affect a logistics service provider's ability to reach a desired positioning in the market for logistics services via an alteration of their underlying business models.

III. The Conceptual Framework Of Business Modeling

A. Components of Business Models

Business models reflect business ideas as well as ways and means for the realization of these ideas [14]. Beside others, their functions are to understand and share, to analyze and to manage the underlying businesses [16]. They provide a basis for the improvement of today's businesses, help to differentiate from competitors and to understand a company's internal weaknesses and strengths [25]. In a first business model description of Timmer (1998) a business model is defined as *"an architecture for the product, service and information flows, including a description of the various business actors and their roles; and a description of the potential benefits for the various business actors; and a description of the sources of revenues"* [27, p. 4].

Building on this definition several authors built categorizations for components of business models [e.g. 29]. Stähler (2001) mentions the following three as the key components: Value proposition, added value architecture and the income model [25].

B. Customer Value Proposition

A customer value proposition is widely understood as the sum of benefits that a product or service provider promises his customers less the payment the customer is charged with [2]. In a wider perspective it refers to the value all stakeholders [8] that participate in the respective value net can gain from the respective business model. According to Nalebuff and Brandenburger (1996) the value net surrounding a company or a business model consists of suppliers, competitors, customers as well as complementors. Complementors are those economic actors whose products or services increase the value that customers perceive from the respective business model's service. A competitor, in contrast, is an economic actor whose product decreases this value [15]. Stähler (2001) subsumes the stakeholders addressed by the value proposition to on the one hand the customers and on the other hand other partners in the respective value-added network [25].

For the customers the value proposition is defined by the utility the customer can gain from the respective service. In other words, it focuses on the satisfaction of customers' needs. Hence, it implies a negative selection in terms of choosing which corporate activities for which customers' needs should not be accomplished within the respective business model.

For the partners in the respective value network the value proposition is defined by the utility they can gain from participating in or contributing to the value network, whether they are suppliers or complementors [25].

C. Added-Value Architectures

The second component of a business model is the architecture of the service creation process, which refers to

the organizational and technological realization of the value proposition. Stähler (2001) distinguishes, beside the external architecture and the degree of its stability, between the product/market conception and the internal architecture, which shall exemplify the idea of added value architecture in the following.

The product/market conception in service oriented business models defines, which concrete service or bundle of services will be provided in order to satisfy the customers' needs promised in the value proposition. Therewith, this conception defines also in which market(s) (geographically as well as segment oriented) the respective company will be active. Corresponding to the negative selection in the decision for a certain value proposition, a decision will be rendered within the product/market conception, which services will not be provided by the business model [25].

The internal architecture of the service creation process serves as the basis for the realization of the product/market conception for satisfying customers' needs and hence, the value proposition. Besides the different tiers of value creation, communication channels and mechanisms as well as the differentiation to the external value creation architectures the internal architecture describes the company's internal resources [25]. From a resource-based perspective [17, 23] the resources (such as assets or competences [18]) can be regarded as the most essential components for the success of a business model and its ability to differentiate from competitors.

D. Income Models

The income model defines the sources from which and the way in which a business model gains its revenues. It configures the prices of the provided services. Hence, if different services are provided, the income model determines, which service will be conducted to which price. Correspondingly, it determines the scope of possibilities to negotiate with customers and the degree to which advances can be made to e.g. long-term contract partners. Furthermore, it defines how the prices will be charged (e.g. one-time payment versus standing orders). Combined with the cost structure, which is defined by the value proposition and the added-value architectures, the income model determines the structure for the margins that can be generated by the business model. Hence, the income model defines the attractiveness of the business model for existing or potential shareholders. Several different types of revenue types can be defined whose mixtures describe the income model of a certain business model [25].

With recourse to the adjustments of these components in order to reach a certain positioning in the market for logistics services, the question arises how they would be affected by an alteration of the service provider's degree of autonomous cooperation.

IV. Potentials And Risks Of Autonomous Cooperation For Logistics Service Providers' Business Modells

A. Flexibilization Effects of Autonomous Cooperation

Wycisk (2009) shows that an increase of the characteristics of autonomous cooperation in the service system of a logistics service provider can lead to an increase of the respective company's strategic flexibility [31].

According to Hülsmann and Grapp (2005) as well as Wycisk (2009) does autonomous cooperation lead to a shift of the complexity the whole logistics system has to cope with, to its subsystems (e.g. business units) and elements (e.g. logistics objects) [10, 31]. Hence, the main management's task is not rendering decisions for every single element, but to focus on establishing guiding policies, encouraging creativity of the system's elements [7] as well as designing basic competences that enable a target oriented future development of the system driven by local units [21]. Hence, fast responses to alterations in the respective company's relevant environment (e.g. emerging of new technologies, changing of customers' service preferences) is enabled by an overall increase of decision-making velocities, which, in turn, are enabled by the single system's elements' accessibility to local information and empowerment to render decision autonomously [13].

With respect to these potentials for increasing strategic flexibility the question arises, how the concept of autonomous cooperation can be used by logistics service providers for alterations of their underlying business models?

B. Components of Strategic Flexibility

With recourse to the definition of strategic flexibility of Burmann (2002) two differing components of the resulting system- behavioral potentials can be identified:

- Amplitude of behavioral options
- Velocity of behavioral reactions [3].

The amplitude of behavioral options refers to the amount of options a system or a sub-system can choose from. The velocity of behavioral reactions describes how fast a system can change its behavior by selecting options out of the pool of options, determined by the amplitude. Wycisk (2009) shows that an increase of the degree of autonomous cooperation can increase both the velocity as well as the amplitude of behavioral options in different categories, such as the option to change, to innovate, to extend, to reduce, to delay an investment, to cancel or to change logistics locations [31]. Hence, the question arises, how increases in the velocities and amplitudes of suchlike options affect the potentials to alter the business models of logistics service providers. Therefore, potential exemplary effects on the value proposition, the added-value architecture and the income model will be discussed in the following.

C. Possible Effects on the Customer Value Proposition

The customer value proposition of a logistics service provider can be affected by an increased strategic flexibility through autonomous cooperating processes in positive as well as negative ways.

An increase of the amplitude of behavioral options can increase on the one hand the potentials for a wide scope of customers' demands to be satisfied by the business model. Correspondingly it creates potentials for a wide scope of possible reactions on environmental changes and utility structures of value net participants. On the other hand, a high amplitude bears the risk of loosing abilities to sufficiently satisfy customers' demands in the core fields due to a binding of capacities and therewith an inefficient distribution of systems' activities. Correspondingly, the risk of being unable to sufficiently address the utilities of the most important value net participants due to capacity binding through maintaining the wide scope of options might occur.

An increase of the velocity of behavioral reactions increases on the one hand the logistics service provider's ability to address changing customer demands to be satisfied by choosing from the scope of possible behavioral options. Correspondingly, potentials occur to rapidly react on changing utility structures of value net participants. On the other hand, market reactions that are too fast bear the risk to bind capacities in the long run on customer demands that have changed only for a short-term. The same is true for too fast reactions on changing environments and utility structures of value net participants. If such changes are only temporarily and the logistics service provider changes in accordance to that its customer value proposition investments might be necessary that will not prove profitable in the long run.

D. Possible Effects on the Added- Value Architecture

Both, positive as well as negative effects on the added-value architecture of a logistics service provider can be assumed by an increased strategic flexibility.

An increase of the amplitude of behavioral options can increase potentials for a wide scope of differing services and therewith for an individualization of the services the logistics company is generally able to provide. A high velocity of behavioral reactions of the respective logistics service provider enables it to accomplish the necessary steps in changing the logistics services regarding the change in the customer value proposition in a short time period.

These potentials are however accompanied by the risk to bind organizational capacities on the target to be able to provide a wide range of services at the expense of loosing the ability to focus on the quality of a special single service, in which the company's respective core competence lies. Correspondingly to the behavioral velocity- risks regarding the customer value proposition, the risk occurs that changing customer's demands are only temporarily but might require investments that will therefore not prove profitable in the long run.

Regarding the internal architecture necessary for realizing the customer value proposition an increase of the amplitude of behavioral options reflects, beside others, an increase of the logistics service provider's ability to reconfigure its resource- and competence- base. The respective velocity of this ability reflects the ability to reconfigure the company's resources and competences according to fast changing customers' demands if possible in real time. However, these potentials are accompanied by the risk of an evolvement of a non-consistent configuration of the company's resources and competences, which might result in a chaotic interplay between them. This might decrease the service quality, which is dependent on this interplay. Furthermore, a high velocity of resource and competence reconfiguration might include the risk of uncontrollable system development with undesired results regarding the company's positioning on the market for logistics services.

E. Possible Effects on the Income Models

Finally, the income models can be affected by an increased strategic flexibility through autonomous cooperating processes positively as well as negatively.

The first side of the income model is the cost structure. An increase of the amplitude of behavioral options might include an increase of the amount of options regarding the cost structure that underlie the logistics services provided. In consequence, the logistics service provider has more possibilities to choose from and hence, to minimize the incurring costs. In accordance to that, a higher velocity of the selection processes enables the logistics service provider to conduct situation specific alterations of the underlying cost structure with decreased transition periods. On the contrary, risks occur from high amplitudes of options regarding the cost structure when local decision rules (e.g. always select the cheapest option) differ from the company's overall strategic adjustments (e.g. aiming at being a quality leader). High velocities of such selection processes might lead to resulting cost structures that are not desired by the company's overall goals due to uncontrollability of local decision-makings.

The second side constitutes the revenue model. An increase of the respective amplitude of behavioral options increases the service provider's ability to individualize the prices of their services (e.g. higher prices for customers that have a higher willingness to pay). Correspondingly does a higher velocity lead to possibilities to alter prices more rapidly (e.g. reactions on competitors' efforts to under price the service).

On the contrary and corresponding to the risks resulting from flexible cost structures, the risk occurs that high amplitudes of options regarding the price structure lead to differences between local decision rules (e.g. always provide the best price for the customer) and the company's overall strategic adjustments (e.g. high service quality at the expense of high prices). Hence, high velocities of the respective (decentralized) selection processes might exacerbate the management's ability to control the whole system's development and therefore, to intervene if necessary.

V. CONCLUSIONS

The overarching aim of this paper was to identify potentials as well as risks for an alteration of a logistics service provider's business model that could arise from an increase of the company's strategic flexibility via an increase of the degree of autonomous cooperation in its underlying logistics processes. Exemplary hypotheses regarding the

effects of increased strategic flexibility on the respective business model show that positive as well as negative effects might occur. In consequence, autonomous cooperation and the associated usage of technologies offers potentials for companies to alter their underlying business models for a new and sustainable positioning in the respective markets. But they should be aware of associated risks that accompany autonomous cooperating processes and that have not been analyzed to sufficient degrees yet. Furthermore, the hypotheses generated in this paper are only exemplary and give rise to the necessity of further developments of hypotheses and following verifications in future research. Hence, empirical studies are required in which autonomous cooperation- based alterations of logistics business models can be shown and analyzed regarding their effects on the overall performances of logistics service providers.

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