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STRATEGIC FLEXIBILITY IN GLOBAL SUPPLY CHAINS – COMPETITIVE ADVANTAGE BY AUTONOMOUS COOPERATION

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ABSTRACT

Global supply chains (GSCs) are confronted with the phenomenon of hyper-competition. For this reason there seems to be an increasing necessity for GSCs to build up competitive advantages for the maintenance of their existence. Strategic flexibility is assumed to have positive effects on generating required competitive advantages by replicating and reconfiguring competences to manage GSCs. Autonomous cooperation (AC) as a management approach might contribute to achieving flexibility in GSCs. Therefore, this paper intends to illuminate possible contributions of AC to creating flexibility and in turn to generating competitive advantages in GSCs.

NEED OF COMPETITIVE ADVANTAGES IN GSCS

One phenomenon in the current business world is hypercompetition (D'Aveni, 1995, p.45; Thomas, 1996, p.221). Hypercompetition describes a condition under which businesses move fast to compete in the fields of price-quality positioning, creation of knew knowledge, protection as well as invasion of established markets and formation of alliances (D'Aveni, 1995, p.46). Under hypercompetition, established rules are repeatedly challenged, industry boundaries become increasingly ambiguous and customer loyalty is difficult to sustain. In other words, fast changes (e.g. development in technology) in the environment force businesses to move rapidly and intensely in order to build new advantages while undermining the advantages of their competitors (D'Aveni, 1994, pp.127).

Embodied in specific capabilities or resources, competitive advantages are necessary for businesses to achieve relatively higher performance than their competitors (Wiggins and Ruefli, 2002, p.84). Its necessity can be explained from a social system theoretical view. An organization has to constantly adapt to changing and diverse environmental conditions in order to get necessary resources (e.g. information) and opportunities (e.g. consumer demands) to exist in the long run (Hicks and Gullett, 1975, pp.387). But the supply of the environment is limited (Sanchez and Heene, 1997, p.23), which is reflected in aspects like constrained natural resources and consumer purchasing power. Better performance than its competitors through competitive advantages would help an organization to secure needed resources and opportunities by better satisfying the requirements of its environment. However, under hypercompetition featured by fast moves among competitors, sustainable competitive advantages are hardly achievable (Williams, 1992, p.29). Instead, businesses continually try developing a series of temporary advantages.

Under competitive pressure, individual businesses often seek cooperation with members of their respective supply chains (SCs), wishing to leverage the resources of each other (Geoffrion and Powers, 1995, p.109). As involved organizations have the common goal of providing value-added products or services, a SC can be regarded as one single organization which competes with other SCs (Lambert and Cooper, 2000, p.65). Consequently, every SC strives for competitive advantages over other SCs. The removal of trade barriers and technological progresses in transport as well as telecommunication allow many SCs to expand out of their national borders, to enter new markets and to locate business processes in different countries (Schary and Skjøtt-Larsen, 2001, p.346). Under such conditions, activities, processes and structures of a number of organizations are interwoven worldwide, where the management has to deal with multiple interrelations between actors situated in distinctive economic, political and social environments. Thus, SCs with global characteristics could be defined as GSCs.

However, satisfactory performance of GSCs is often impeded by increasing complexity and dynamics resulting from hypercompetition. From a social system theoretical perspective, complexity is based on the number and variety of a system's elements as well as of relations between elements (Patzak, 1982, p.23). Due to hypercompetition, a SC may be forced to include new relationships with international qualified partners and to explore international market segments. Compared with domestic SCs, additional factors like various demands of worldwide customers, different cultures, distinctive local institutions as well as interactions between them and the GSC add more elements and relations. Dynamics describe the variation of a system's state over time (Coyle, 1977, p.1). For a GSC, due to the multiple systemic linkages as well as temporal changes, dynamics of the surrounding systems (e.g. rapid changes in competitors' strategies, vibrating exchange rates, changing local policies) have an impact on dynamics in logistics processes (Hülsmann, 2003, p.193). The increasing complexity and dynamics imply an immense exchange of data in a short time period between members of the GSC and therefore the risk of an information overload for decision-making as well as the risk of untimely response to changing demands of the environment. This can lead to a weak performance of the GSC. In such situations, competitive advantages are needed for GSCs to deal with complexity and dynamics for adaptation to the global environment. However, which capabilities are needed to achieve competitive advantage in the context of GSCs?

NEED OF FLEXIBILITY TO GAIN COMPETITIVE ADVANTAGE

Possible means for gaining competitive advantages might be found in strategic flexibility. Strategic flexibility refers to the ability of an organization to adapt to uncertain environmental changes, which have substantial impacts on the organization's performance (Aaker and Mascarenhas, 1984, p.74) such as competitors' taking away major customers or qualified suppliers. The emphasis on flexibility results from the fact that strategic planning fails to work in face of "conflicts of interest or lack of time, information or analytical capability", which reflects the unintended and emergent nature of strategy (Genus, 1995, p.12).

From a social system theoretical perspective, flexibility is the ability of a system to open its boundaries for necessary resources and opportunities (Hülsmann and Wycisk, 2005). Integration enables a system to communicate with the environment

through mutual inter-relations and thus sustains the existential exchange process of resources (Staehle, 1999, p. 417; Böse and Schiepek, 1989, p. 121). This process of integration is implemented by system openings (Luhmann, 1973, p. 173), through which the system absorbs a part of the complexity of the environment (i.e. information). Flexibility contributes to creating competitive advantages through processes of retaining, developing and regenerating competences. The generation of competitive advantages is based upon unique, valuable, inimitable and nonsubstitutable competences (Well 2001, p.151; Hitt et al., p.2005, pp.84). Therefore, it is desirable for a system to consolidate, develop and regenerate competences (Al-Laham, 2003, p.160; Teece et al., 1997, p.524), which creates a wide competence spectrum and ensures a continuous internal readiness for change.

Two commonly recognized dimensions of flexibility are range of alternatives and response to changes by adopting alternatives. The former counts the number of options while the latter measures the reaction time (Upton, 1994; Burmann, 2005). It can be stated that an increased number of options as well as decreased time lead to a higher level of flexibility. These two dimensions of flexibility result from the abilities of an organization to replicate and to reconfigure its processes and competences (Teece et al., 1997, pp.518). The ability of replication makes it possible for the organization to multiply existing processes. In the context of GSCs, an example could be that the effective communication process via a certain software between two members is adopted by all other members, which could ensure the stable and timely transfer of data throughout the whole chain. On the one hand, this ability of replication enables a fast and efficient growth of the GSC by avoiding the waste of money and time on exploring new means for development (Teece et al., 1997). On the other hand, it stimulates the members' understanding of existing competences regarding structures and functions through expanding competences to a large number of elements (e.g. people, functional units) (Burmann, 2005, p.300). In this sense, replication retains existing profitable competences, which are in turn prerequisite for identifying, assimilating and applying useful external information to generate new competences (Cohen and Levinthal, 1990). The ability of reconfiguration enables an organization to transform the structure of its resources and thus its competences (Teece et al., 1997, p.520). This ability enables an organization to develop and generate new competences: one method is to recombine the know-how existing in the organization and (e.g. the combination of competences in fast distribution and lean production) the other is to absorb new knowledge from the environment (e.g. developing innovation competence by recruiting talents) (Burmann, 2005, pp.301). The new knowledge resulting from both methods could widen choices for coping with changes in the environment and competition. An example in the context of GSCs could be as this: a GSC delivering cell phones can either shorten the delivery time to local customers, or develop a new product better fitting the local cultural preference (e.g. shape and colour), or use the combination of both to compete with a rival who introduces a cell phone with popular technical features.

Replication and reconfiguration are interdependent regarding the creation of flexibility. On the one hand, a large variety of options but slow reaction give competitors chances to take away resources and opportunities which are important for the operation of the system (Burmann, 2005, p.303). Besides, it could happen

that the newly developed strategic option is again unable to meet the requirements of the environment, which meanwhile might have been changed. On the other hand, though standardization of processes and products through replication can enhance GSCs' response to changes in the environment, it could weaken the system's ability to address variety in consumer preferences (Burmann, 2005, p.304). As a consequence, flexibility featured by a high level of both replication and reconfiguration abilities can possibly contribute to the creation of competitive advantages. However, how can this deduced need for strategic flexibility be satisfied? It has to be examined if there are appropriate management approaches to gain strategic flexibility in GSCs.

AC AS A MANAGEMENT APPROACH IN GSCs

A management approach, which is presently discussed in management science is the concept of AC. It refers to processes of decentralized decision-making in heterarchical structures. AC presumes that interacting elements in non-deterministic systems have the capability and possibility to render decisions independently and aims at achieving increased robustness and positive emergence of the total system (Hülsmann and Windt, 2005).

In complex and dynamic systems like GSCs, AC means leaving operative decision-making to subsystems or system elements, which are within a heterarchical structure and operating independently from a centralized planning unit. These subsystems or elements could be functional units, persons, equipments and resources (Delfmann, 1998, p.309). For non-living items, the intelligence enabling decision-making is endowed by modern information and communication technologies such as RFID (radio frequency identification) or Bluetooth (Scholz-Reiter et al., 2005). Decisions, relations and interactions independent of external instances are formed, guided and developed autonomously (Probst, 1987, p.82). But this autonomy is relative (Varela, 1979; Probst, 1987, p.82), because it is constrained by GSC's objectives, which generally speaking are to maximize the added value observed by final customers (Debo et al. 2004, p.296). When the autonomous decision-making of subsystems turns out to deviate the GSC performance from the desired one, the management might withdraw this power or the GSC might stop functioning. The achievement of objectives depends on the cooperation between GSC elements such as through information-sharing and co-designed distribution channels, which facilitate information and material flow. Decision-making needs relevant information. Instead of centrally processing all information, AC allows elements to obtain most relevant information by interacting with nearby elements. In consequence, the ability of elements to interact is the prerequisite for decentralized decision-making and in turn autonomous control (Windt et al., 2005). An example in GSCs can be the reallocation of retail inventories on different national markets. Instead of being transported back to the manufacturer (e.g. extra inventories from Singapore to US) and then be reallocated (e.g. from US to China), inventories could realize a more efficient and effective flow among retailers through direct communication (inventories being shifted directly from Singapore to China). Though AC predetermines the rules of decision-making for elements and outlines the desired state of the system by setting common goals for system elements, the way of how elements can achieve the objective is not stipulated. As a result, the system's behaviour cannot be causally predicted and thus can be considered as non-deterministic (Haken, 1983). For GSCs, it could be

the case that a retailer has different strategies to cope with decrease in consumer demand (e.g. promotion, advertisement according to preferences of local customers) or the sourcing unit of the manufacturer has several schemes for choosing suppliers (e.g. all supply from one supplier or from several suppliers). But if AC as a management approach could be applied to GSCs, what are its contributions to the creation of competitive advantages?

CONTRIBUTIONS OF AC TO THE CREATION OF FLEXIBILITY AND COMPETITIVE ADVANTAGES in GSCS

Autonomy seems to allow shifting complexity of the GSC to its subsystems and elements so that complexity is reduced to partial complexity (Hülsmann and Grapp, 2005). The quantitative level of complexity decreases for the management, which now only needs to establish guiding policy, encourage creativity of local elements (Forrester, 1958, p.66) and design basic competences for future development by local units (Sanchez, 1997, p.81). For subsystems and elements, a smaller environment suggests the handling of fewer changes with less coordination efforts. The spatial closeness can lead to fast responses to a changing environment, because the time needed for generating decisions becomes shorter with the availability of relevant information (Hülsmann and Wycisk, 2005). However, the timely generation and implementation of decisions are preconditioned by the necessary competences available to the GSC elements, which are gained through interaction. As in an autonomously cooperating GSC relevant information is exchanged between elements instead of being passed from management to local elements, there tends to be a higher degree of interaction between these elements (e.g. data transfer through advanced communication means) (Laux and Liermann, 1993, p.212). To support its elements to solve problems, management might arrange transparency regarding the existing pool of competences (e.g. by encouraging personnel exchange among elements). Thereby, elements could solve problems with problem-specific competences or with combinations of relevant competences (Hülsmann and Wycisk, 2005). With competences being replicated at local elements (e.g. high reliability products design, customer-friendly design), the common pool of competences will be enriched. Consequently, this process of competence replication may lead to a higher level of flexibility.

At the same time, because of a more detailed overview concerning relevant information (e.g. exchange rates, local policies, transportation infrastructure) for a specific task, GSC elements could possibly identify more clearly the gap between their current competences and the expectation of the environment. Consequently, they might use the freedom to reconfigure various patterns of competences which enable better adaptation to their environment. Non-determined spaces of action encourage new ways to solve problems in trial and error processes (Hülsmann and Wycisk, 2005). On the one hand, GSC elements can retain effective competences through these processes (Wolf, 2003, p.293). On the other hand, due to the context-specificities (e.g. local communication infrastructure, cultural preference), GSC elements have to absorb external information and combine it with existing competences to cope with certain tasks (Macharzina, 2003, p.73). This process of reconfiguring competences might contribute to achieving more flexibility in GSC in the way shown above.

Therefore, by implementing AC the flexibility of GSCs might be enhanced with

processes of competence replication and reconfiguration. In turn, flexibility of GSCs may lead to competitive advantages from a competence-based view. In this perspective, flexibility could facilitate the development and application of competences from the common pool by GSC elements. These processes could be understood as competence building, leveraging and maintaining (Sanchez, 2004, p.57). A cumulative large variety of competences open to all subsystems increases the possibility of effective and rapid coping with the changing environment and assist a GSC in obtaining limited resources and opportunities while its competitors strive for developing comparable competences (Teece et al., 1997). In GSCs, some competences could be understood as customer-tailored designing regarding products (e.g. cultural preferences of shape, colour) and services (e.g. lead time). As such competences are created and shared by elements of whole GSCs, the aggregated effect like customized products, short delivery time and high service level might raise the value of goods perceived by customers on different local markets. Thereby, consumers might prefer these GSC' goods to those of other GSCs. This might lead to better performance of the GSC and competitive advantages.

Nevertheless, AC could also have negative implications for management of GSCs. Firstly, the increased degree of flexibility implies an asymmetrical distribution of information between the management and GSC elements. The lack of detailed information on individual processes can result in the management's inability to effectively regulate its elements. Consequently, subsystems may misuse autonomy and take actions fitting their own needs but incompatible with environmental requirements. Secondly, processes of decentralization might lead to egoism of GSC elements, which focus only on the own systems' borders and lose the view of the whole GSC (Staehle, 1999, pp.301). Such egoism can decrease the GSC's stability by diminishing its identity (e.g. selecting new distributors by the manufacturer). Thirdly, non-determinism implies unpredictability of GSC behaviour and makes it difficult for management to design and control plans according to general causal patterns (Bruns-Vietor, 2004). Fourthly, to give non-living elements autonomy and making them intelligent requires a high investment in technology. As the concept of AC is still at its developing phase, the lack of empirical proof of its effects on creating competitive advantages could result in unwillingness of GSC members to invest in expensive technologies. Opportunism of GSC elements, instability of GSCs and uncontrollability could deviate GSCs from a desired state while a financial investment in technology could negatively influence the GSCs' efficiency. The above sketched aspects could lead to a negative impact on the performance of GSCs and thus deprive GSCs of competitive advantages.

In general, AC might lead to flexibility and in turn have positive effects on creating competitive advantages. Nevertheless, the existence of possible negative effects of AC on GSCs' performance implies the necessity of further research, e.g. on measuring AC to find out its optimum degree for a specific GSC. Additionally, the conceptualization of AC's contribution to creating flexibility and competitive advantages seems to need empirical studies. A reason for this is to increase validity of this management approach regarding its possible application in GSCs.

REFERENCES

Aaker, D. A. & Mascarenhas, B. (1984). The need for strategic flexibility. *Journal of*

Business Strategy, 5(2), 74-82.

Al-Laham, A. (2003). Organisationales Wissensmanagement. München: Vahlen.

Böse, R. & Schiepeck, G. (1989). Systemische Theorie und Therapie. Heidelberg: Asanger.

Bruns-Vietor, S. (2004). Logistik, Organisation und Nezwerke-Eine radikal konstruktivistische Diskussion des Flie?systemansatzes. Frankfurt am Main: Lang.

Burmann, C. (2005). Ressourcentheoretische Konzeptualisierung strategische Flexibilität. In C. Burmann, J. Freiling& M. Hülsmann(Ed.), Management von Ad-hoc-Krisen: Grundlagen, Strategien, Erfolgsfaktoren, 297-310, Wiesbaden: Gabler.

Cohen, W. M.& Levinthal, D. A. (1990). Absorptive capacity-a new perspective on learning and innovation. Administrative Science Quarterly, 35(1), 128-152.

Coyle, R. G. (1977). Management system dynamics. London: John Wiley & Sons.

D'Aveni, R. A. (1995). Coping with hypercompetition: utilizing the new 7S's framework. Academy of Management Executive, 9(3), 45-57.

Debo, L. G., Savaskan, R. C. & Van Wassenhove, L. N. (2005). Coordination in closed-loop supply chains. In R. Dekker, M. Fleischmann, K. Inderfurth& L. N. V. Van Wassenhove(Ed.), Reverse Logistics, 296-311, Springer.

Delfmann, W. (1998). Kernelemente der Logistikkonzeption. In P. Klaus& W. Krieger(Ed.), Gabler Lexikon Logistik, Management logistischer Netzwerke und Flüsse, 308-312, Gabler.

Forrester, J. W. (1958). Industrial dynamics. Harvard Business Review, 36(4), 37-66.

Genus, A. (1995). Flexible strategic management. London: Chapman & Hall.

Geoffrion, A. M. & Powers, R. F. (1995). Twenty years of strategic distribution system design. Interfaces, 25(5), 105-127.

Haken, H. (1983). Erfolgsgeheimnisse der Natur: Synergetik, the Lehre vom Zusammenwirken. Stuttgart: Dt. Verl.-Anst.

Hicks, H. G. & Gullett, C. R. (1975). Organizations: theory and behavior. New York: McGraw-Hill.

Hitt, M. A., Keats, B. W. & DeMarie, S. M. (1998). Navigating in the new competitive landscape: building strategic flexibility and competitive advantage in the 21st century. Academy of Management Executive, 12(4), 22-42.

Hülsmann, M. (2003). Management im Orientierungsdilemma. Wiesbaden: Dt. Univ.-Verl.

Hülsmann, M. & Grapp, J. (2005). Autonomous cooperation in international supply networks. 10th International Symposium on Logistics, Loughborough, United kingdom.

Hülsmann, M. & Windt, K. (2005). Selbststeurung-Entwicklung eines terminologischen Systems. Forschungsbeitraege zum Strategischen Management, 7.

Hülsmann, M. & Wycisk, C. (2005). Unlocking organizations through autonomous cooperation - applied and evaluated principles of self-organization in business structures. 21th EGOS Colloquium, Berlin, Germany.

Lambert, D. M. & Cooper, M. C. (2000). Issues in supply chain management. Industrial Marketing Management, 29(1), 65-83.

Laux, H.& Liermann, F. (1993). Grundlagen der Organisation. Berlin: Springer.

Luhmann, N. (1973). Zweckbegriff und Systemrationalität. Frankfurt am Main:

Suhrkamp.
Patzak, G. (1982). Systemtechnik. Berlin: Springer.
Probst, G. B. J. (1987). Selbstorganisation: Ordnungsprozesse in sozialen Systemen aus ganzheitlicher Sicht. Berlin: Parey.
Sanchez, R. (1997). Preparing for an uncertain future: managing organizations for strategic flexibility. International Studies of Management & Organization, 27(2), 71-94.
Sanchez, R. (2004). The new strategic management: organization, competition and competence. New York: Wiley.
Sanchez, R. & Heene, A. (1997). Managing for an uncertain future. International Studies of Management & Organization, 27(2), 21-42.
Schary, P. B. & Skjøtt-Larsen, T. (2001). Managing the global supply chain. Copenhagen: Copenhagen business school press.
Scholz-Reiter, B., Freitag, M., de Beer, C.& Jagalski, T. (2005). Autonomy in production logistics.Fraunhofer IRB Verlag.
Staehle, W. H. (1999). Management: eine verhaltenswissenschaftliche Perspektive. München: Vahlen.
Teece, D. J., Pisano, G. & Shuen, A. (1997). Dynamic capabilities and strategic management. Strategic Management Journal, 18(7), 509-533.
Thomas, L. G. (1996). The two faces of competition: dynamic resourcefulness and the hypercompetitive schift. Organization Science, 7(3), 221-242.
Upton, D. (1994). The management of manufacturing flexibility. California Management Review, 36(1), 72-89.
Varela, F. J. (1979). Principles of biological autonomy. New York: North Holland.
Well. v. B. (2001). Ressourcenmanagement in strategischen Netzwerken. In G. Ortmann& J. Sydow(Ed.), Strategie und Strukturation, 145-172, Wiesbaden: Gabler.
Wiggins, R. & Ruefli, T. W. (2002). Sustained competitive advantage: temporal dynamics and the incidence and persistence of superior economic performance. Organization Science, 13(1), 81-105.
Williams, J. R. (1992). How sustainable is your competitive advantage? California Management Review, 34(3), 29-51.
Windt, K., Boese, F.& Philipp, T. (2005). Criteria and application of autonomous cooperating logistic processes. 3rd International Conference on Manufacturing Research-Advances in manufacturing technology and management, Cranfield.
Wolf, J. (2003). Organisation, Management, Unternehmensführung-Theorien and Kritik. Wiesbaden: Gabler.