

MODEL OF THE CO-OPERATIVE TRADE ALLIANCE FOR INDEPENDENT RETAIL NETWORKS IN CZECH REPUBLIC

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Abstract

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The main objective of the contribution is proposal of the model of co-operative trade alliance for independent trade alliances with fast-moving consumer goods (FMCG) in Czech Republic. Reason of the choice of this topic is sustain of variety of retail formats in Czech market in connection with position small and medium sized trade firms in comparison with transnational trade chains. Independent trade firms face to much bigger competitors operating supermarkets and hypermarkets, namely not even in size of sales area, width and depth of the assortment but also in possibility of negotiation of more profitable trade conditions with their suppliers. Effort of these independent trade firms, which operate mostly just in local or maximally regional market, is then mutual co-operation in form of consumer co-operatives, associations, alliances and networks. These groupings then mainly through common trade negotiation and purchase get for much more advantageous delivery and payment conditions from their suppliers. Besides they can participate in mutual financing of using of promotion instruments. Partial aim of the paper is investigation of opinion and willingness of Czech trade alliances with FMCG to utilize the opportunity of mutual co-operation in common trade alliance. Next partial goal is identification of the factors affecting formation of joint co-operative grouping and its structure, eventually definition of entry conditions which should be fulfilled by individual members. The system approach will be used to realize the given objective. This approach appears as the most suitable in consideration of anticipated structure and character of supposed model. The result will be then proposal of model of mutual co-operation between individual trade alliances.

trade, retail, alliance, cooperation, independent trade, distribution, purchase

Global competition highlights asymmetries in the skill endowments of firms. Collaboration may provide an opportunity for one partner to share the skills of the other, and thus improve its position both within and without the alliance. One of the main reasons that firms participate in alliances is to learn know-how and capabilities from their alliance partners. At the same time firms want to protect themselves from the opportunistic behaviour of their partners to retain their own core proprietary assets.

Firms use alliances for a variety of reasons: to gain competitive advantage in the marketplace, to access or internalize new technologies and know-how beyond firm boundaries, to exploit economies of

scale and scope, or to share risk or uncertainty with their partners. On the one hand, alliances may help a firm absorb or learn some critical information or capability from its partner. On the other, they also increase the likelihood of unilaterally or disproportionately losing one's own core capability or skill to the partner.

Conflict is inherent in alliances because of partner opportunism, goal divergence (Doz, 1996) and cross-cultural differences, and using explicit mechanism to manage conflict will help firms to deal with these difficulties. There has been a general tendency in the alliance literature to link formal governance mechanisms with the management of conflicts (Williamson, 1985). But more recently, there is recogni-

tion that a combination of contractual and organizational mechanisms (formal and informal) is more effective in managing conflict (Doz, 1996; Dyer and Singh, 1998).

It is possible to conceive of a firm as a portfolio of core competencies on one hand, and encompassing disciplines on the other, rather than as a portfolio of product-market entities (Prahalad and Hamel, 1990). The traditional competitive strategy paradigm (Porter, 1998), with its focus on product-market positioning, focuses on only the last few hundred years of what may be a skill-building marathon. The notion of competitive advantage which provides the means for computing product based advantages at a given point in time (in terms of cost and differentiation), provides little insight into the process of knowledge acquisition and skill-building.

Cliquet sees the network as a hybrid organizational form consistent with specific assets. It is an efficient governance structure because it maintains market incentives while bureaucratic distortions are avoided (cost minimization). The inter-firm network is considered as a trade system able to plan or react like an integrated firm whose internal efficacy could be compared to market mechanism. The market and the hybrid form are two alternative modes of governance. The choice does not depend on the nature of attributes but on their degree. As a matter of fact, the network is not a proper object. From the introduction of the hybrid firm, it follows that the initial dichotomy between firm (labour relation) and market (trade relation) becomes fuzzy. There would be only contractual arrangements (firm, market and network) in competition. In this continuum thesis, the concept of network is defined by default: no market, nor hierarchy (Cliquet, 2007).

There is another term for cooperation between distribution members in retail literature – vertical marketing system. it consists of all the levels of independently owned businesses along a channel of distribution. Goods and services are normally distributed through one of these systems: independent, partially integrated, and fully integrated. In an independent vertical marketing system, there are three levels of independently owned firms: manufacturers, wholesalers, and retailers. Such a system is most often used in manufacturers or retailers are small, intensive distribution is sought, customers are widely dispersed, unit sales are high, company resources are low, channel members seek to share costs and risks, and task specialization is desirable. With a partially integrated system, two independently owned businesses along a channel perform all production and distribution functions. It is most common when a manufacturer and a retailer complete transactions and shipping, storing, and other distribution functions in the absence of a wholesaler. Through a fully integrated system, one firm performs all production and distribution functions. The firm has total control over its strategy, direct customer contact, and exclusivity over its offering; it

also keeps all profits. This system can be costly and requires a lot of expertise (Berman, Evans, 2010).

METHODS AND RESOURCES

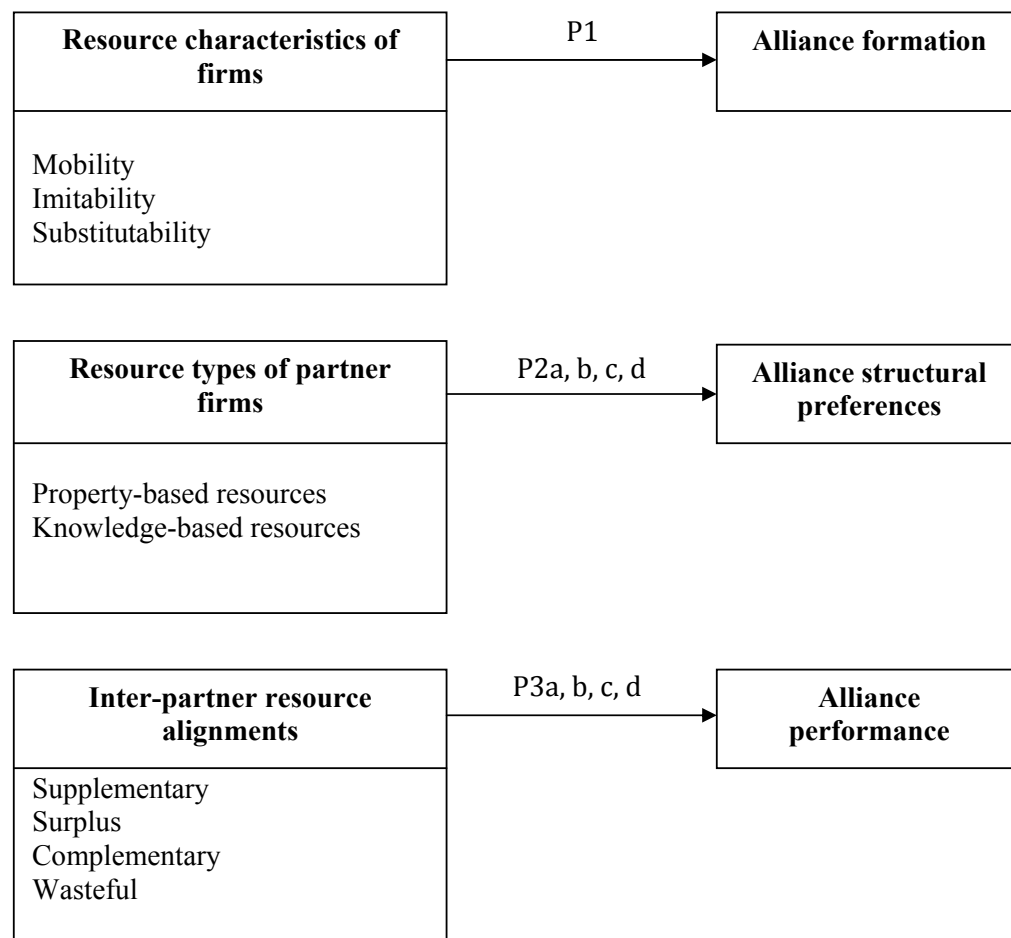
The paper focuses on a general theory of strategic alliances, synthesizing the various findings in the literature on alliances from a resource-based view by examining the role of firm resources in strategic alliances. This theory covers four major aspects of strategic alliances: rationale, formation, structural preferences, and performance. The certain resource characteristics, such as imperfect mobility, imitability, and substitutability, promise accentuated value-creation, and thus facilitate alliance formation. As part of the paper, author proposes a typology of inter-partner resource alignment based on the two dimensions of resource similarity and resource utilization, yielding four types of alignment: supplementary, surplus, complementary, and wasteful. There is also discussion how partner resource alignment directly affects collective strengths and inter-firm conflicts in alliances, which in turn contribute to alliance performance. Finally, suggested theoretical conclusions are implemented on proposal of model of strategic trade alliance for independent food retail networks in Czech Republic.

It is possible to divide the article into four parts. First, identification of the resource characteristics of individual firms that are the antecedents of alliance formation is elaborated. Second, structural preferences for alliances, as determined by the resource types of partner firms are discussed. Third, there is a typology of inter-partner resource alignments and explore the effects of these resource alignments on alliance performance. Fourth, model of alliance in food independent trade is proposed.

RESULTS AND DISCUSSION

Strategic alliances are voluntary cooperative inter-firm agreements aimed at achieving competitive advantage for the partners. A strategic alliance is also when two or more businesses join together for a set period of time. The businesses, usually, are not in direct competition, but have similar products or services that are directed toward the same target audience. Alliance means cooperation between groups that produces better results that can be gained from a transaction. A strategic is a partnership between firms whereby resources, capabilities and core competences are combined to pursue mutual interests. The specific resource profiles of individual firms that tend to encourage the formation of strategic alliances are examined in Fig. 1 for the proposed analytical framework.

Firm resources are important indicators of the likelihood of firms entering into strategic alliances. For instance, the possession of critical resources is a prerequisite for alliance formation. Some resource characteristics that prevent firms from moving toward resource homogeneity have been identified



1: Analytical framework and proposed relationship
Source: Elaborated by author

as: imperfect mobility, imperfect imitability, and imperfect substitutability. Whereas imperfect mobility is concerned with barriers to getting the resources from the owners, imperfect imitability and imperfect substitutability refer to barriers to obtaining similar resources from elsewhere. Imagine a firm whose resources are perfectly or easily mobile, imitable, and substitutable. Clearly, other firms would be in a position to bid desirable resources away from such a firm in factor markets. Only if a firm cannot efficiently get needed resources from elsewhere – except by a sharing arrangement with its owners – will it be willing to form a strategic alliance. The point is that the more imperfect the mobility, imitability, and substitutability of a firm's resources are, the more likely that others will be interested in forming alliances with it.

P1: The more a firm's resources are characterized by imperfect mobility, imperfect imitability, and imperfect substitutability, the more likely the firm will get involved in strategic alliances.

Resource types and structural preferences

The simplest approach differentiates between tangible and intangible resources (Grant 1991). Barney (1991) classifies firm resources into physical capital resources, human capital resources, and organizational capital resources. Author suggests that a firm's resource profile includes the following: financial, physical, managerial, human, organizational, and technological resources. Property-based resources are legal properties owned by firms, including financial capital, physical resources and human resources. Owners enjoy clear property rights to these resources, or rights to use the resources, so that others cannot take them away without the owners' consent. Because others cannot take property-based resources away, alliance partners will not be overly concerned about unintended transfers of these resources (see Tab. I).

Strategic alliances can take a variety of forms, including, but not limited to, joint ventures, minority equity alliances, R&D contracts, joint production, joint marketing and promotion, enhanced supplier partnership, distribution agreements, and licensing agreements. Equity alliances include equity joint

I: *Typical resources based on resource characteristics and resource types*

Resource characteristics	Resource types	
	Property-based resources	Knowledge-based resources
Imperfect mobility	Human resources	Organizational resources
Imperfect imitability	Patents, contracts, copyrights, trademarks	Technological and managerial resources
Imperfect substitutability	Physical resources	Technological and managerial resources

Source: Elaborated by author

ventures and minority equity alliances, non-equity alliances refer to all other cooperative arrangements that do not involve equity exchange. Alliances are unilateral contract-based when they embody a well-defined transfer of property rights, such as the “technology for cash” exchange in licensing agreements. Licensing, distribution agreements, and R&D contracts are the main forms of unilateral contract-based alliances. The key feature here is that individual firms carry out their obligations independently of others. Such contracts tend to be complete and specific, and partners are expected to perform on their own accordingly, without much coordination or collaboration. Thus, the level of integration is relatively low in unilateral contract-based alliances. On the other hand, alliances are called bilateral contract-based when the partners have sustained production of property rights. As compared to unilateral contracts, bilateral contracts are usually incomplete and more open-ended. To some extent, partners of unilateral contract-based alliances have to let the cooperative relationship unfold itself.

Now it is possible to discuss partners’ structural preferences in terms of the four major categories of alliances: equity joint ventures, minority equity alliances, bilateral contract-based alliances, and unilateral contract-based alliances (see Tab. II).

Equity joint ventures are created to substantially integrate the joint efforts of partners – separate entities in which the partners literally work together. Consequently, equity joint ventures provide the best opportunities to acquire partners’ tacit knowledge and other knowledge-based resources. Because equity joint ventures enable a firm to better appropriate its partners’ knowledge-based resources, they are preferable to the firm if knowledge-based resources are its partners’ primary resource in the alliance. On the other hand, the advantage of a joint venture for a particular firm will be limited if its partner contributes mainly property-based resources. Furthermore, although firms will ordinarily want to acquire their partners’ know-how, they are also wary about losing

their own knowledge-based resources in a highly integrated operation characteristic of a joint venture. Thus, they will prefer this type only if knowledge-based resources are not their primary resource type in the alliance.

P2a: A partner firm will prefer an equity joint venture if, in the prospective alliance, its primary resources are property-based and its partner's primary resources are knowledge-based.

In minority equity alliances, one or more partners take an equity position in others. Since equity arrangements are rather complicated to implement as well as to get out of, they are usually entered into for longer time horizons, compared to alliances without equity investments. A long duration for an alliance provides an incentive to partners to behave honestly and curb opportunistic behaviour. Firms will prefer this type when they have primarily knowledge-based resources to contribute to the alliance and their partners have primarily property-based resources. Contract-based alliances will be less attractive in such cases, because they do not offer sufficient safeguards against opportunistic behaviour regarding knowledge-based resources. In this situation, equity joint ventures will also not be preferred, for two reasons. First, there are no substantial knowledge-based resources contributed by the partners available for exploitation. Second, there are altogether too much of one's own knowledge-based resources that the partner could potentially appropriate, making it too risky to form a joint venture.

P2b: A partner firm will prefer a minority equity alliance if, in the prospective alliance, its primary resources are knowledge-based and its partner's primary resources are property-based.

Because equity joint ventures facilitate the process of transferring knowledge-based resources, they can be a disadvantage if both partners have substantial knowledge-based resources in an alliance. Thus, equity joint ventures may be too risky a choice in such situations. First, a firm would be concerned that its own tacit knowledge could be significantly appro-

II: *Resource types and a firm's structural preferences*

Firm (A)	Partner firm (B)	
	Property-based resources	Knowledge-based resources
Property-based resources	Unilateral contract-based alliances	Equity joint ventures
Knowledge-based resources	Minority equity alliances	Bilateral contract-based alliances

Source: Elaborated by author

pritated by its partner firm. Second, when both partners have primarily knowledge-based resources for an alliance, they will be prepared to see the alliance, whether or not it is a joint venture, becoming a learning race (Hamel, 1991). Also, the partners will be likely to believe in their ability to be the leader in such a learning race. Between the two types of contract-based alliances, the better choice is bilateral contract-based alliances if the mission is one of learning. In alliances such as joint production, joint R&D, and joint marketing and promotion, there are many more opportunities for learning than in unilateral contract-based alliances such as licensing and subcontracting.

P2c: A partner firm will prefer a bilateral contract-based alliance, if both partner firms' primary resources, in the prospective alliance, are knowledge-based.

Unilateral contract-based alliances include licensing, subcontracting, and distribution agreements. Their distinct characteristic is a comparatively light engagement of the partners. More "engaged" alliance forms are needed if the purpose of entering into an alliance is to secretly acquire knowledge-based resources. Following this logic, unilateral contract-based alliances will be preferable when both partners intend to contribute primarily property-based resources to a prospective alliance. Since neither firm will be interested in secretly acquiring the other's tacit knowledge, there will be little need for a bilateral contract-based alliance. Unilateral contract-based alliances will provide the requisite clarity for exchange of property rights.

P2d: A partner firm will prefer a unilateral contract-based alliance, if both partner firms' primary resources, regarding the prospective alliance, are property-based.

Inter-partner resource alignment and alliance performance

Performance of strategic alliances can be measured in several different ways, such as alliance longevity and profitability or in terms of meeting the objectives of individual partner firms. Clearly, then the performance of an alliance can be evaluated differently by each partner firm. Partner resource alignment refers broadly to the pattern, whereby the resources of partner firms are matched and integrated in an alliance. This pattern defines the resource-based relationship between the partners. This approach makes the clear assumption, largely unstated, that only resources related and useful to an alliance should be considered. Similar is not the same as supplementary, and dissimilar is not the same as complementary. Resource similarity in alliances is defined as the degree to which two partner

firms contribute resources comparable, in terms of both type and amount, to an alliance. Resource similarity will be high if two partners contribute comparable amounts of similar types of resources to an alliance. Resource utilization, on the other hand, is the degree to which the resources contributed by the partners are utilized for achieving the goals of the alliance. The resource utilization dimension distinguishes performing resources from nonperforming resources. Performing resources are essential for alliance operation. By comparison, non-performing resources remain idle in the alliance; they are brought into the alliance mainly because they are not separable from certain other needed resources. In contrast to the two types of alignment (complementary and supplementary), the two dimensions in Tab. III suggest four types of partner resource alignment: supplementary, surplus, complementary, and wasteful.

Both supplementary alignment and complementary alignment have a positive effect on the collective strengths of the alliance. The more individual firms contribute supplementary resources to an alliance, the more they accumulate critical resources that would not, as a result, be easily available for deployment elsewhere. Since all such resources are of the performing kind (see Tab. III), the employment of these supplementary resources in the alliance suggests the pursuit of a value-creating strategy. Supplemantarity of resources, in this sense, is always beneficial to effective alliance performance.

P3a: Alliance performance is positively related to supplementary alignment.

P3b: Alliance performance is positively related to complementary alignment.

Furthermore, additional surplus and wasteful resources will not contribute to the collective strengths of an alliance, mainly because these resources by definition are not performing. These resources are essentially wasted and do not make the alliance more competitive. Surplus and wasteful resources may be difficult to avoid in alliances, since certain physical and technological resources cannot be easily separated. In any case, the surplus resources do not add to the alliances' collective strengths.

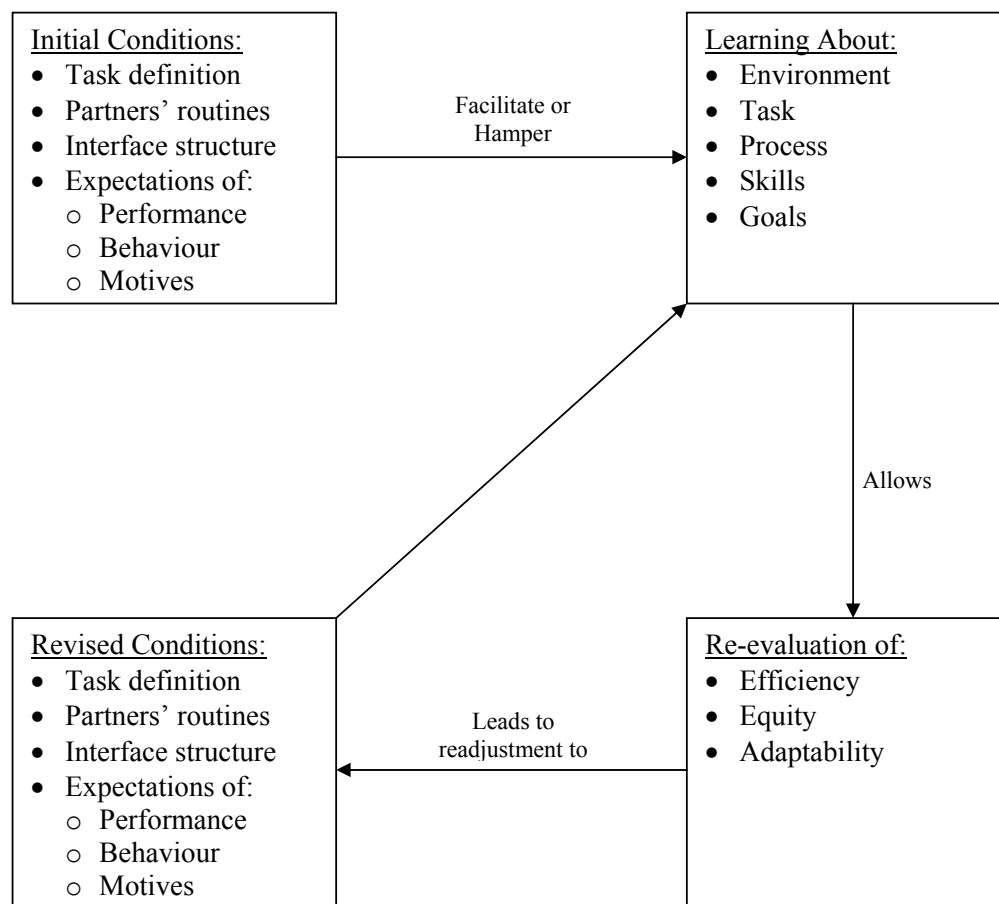
P3c: Alliance performance is positively related to surplus alignment.

Conflicts between partner firms tend to increase with a wasteful alignment, because wasteful resources often suggest a lack of compatibility in the different resources contributed by the partners.

III: A typology of inter-partner resource alignments

Resource similarity	Resource utilization	
	Performing resources	Nonperforming resources
Similar resources	Supplementary (similar-performing)	Surplus (similar-nonperforming)
Dissimilar resources	Complementary (dissimilar-performing)	Wasteful (dissimilar-nonperforming)

Source: Elaborated by author



2: Simplified process of alliance evolution
Source: Elaborated by author

P3d: Alliance performance is negatively related to wasteful alignment.

Formation of strategic alliance in the independent trade with FMCG in Czech Republic

The overall structure of the framework is illustrated in Fig. 2. There is a set of initial alliance conditions that determine whether, and how, learning takes place between the partners.

The initial conditions could be most clearly understood as comprising a definition of the task to be performed, a set of action routines borrowed from the organizational contexts of each partner, a design for the interface between the partners, and a series of expectations about the performance of the alliance (and the behaviour of one's partner) towards and within it. These initial conditions were observed to facilitate or hamper the partner's learning about the environment of their alliance, how to work together to accomplish the alliance task, their respective skills, and each other's goals. Both how each initial condition is set, and the interdependencies they create between learning on various dimensions, influence learning. As the partners engaged into the alliances, and the initial conditions allowed them to start to learn, both cognitively and behaviourally, from the interactions with each other, they

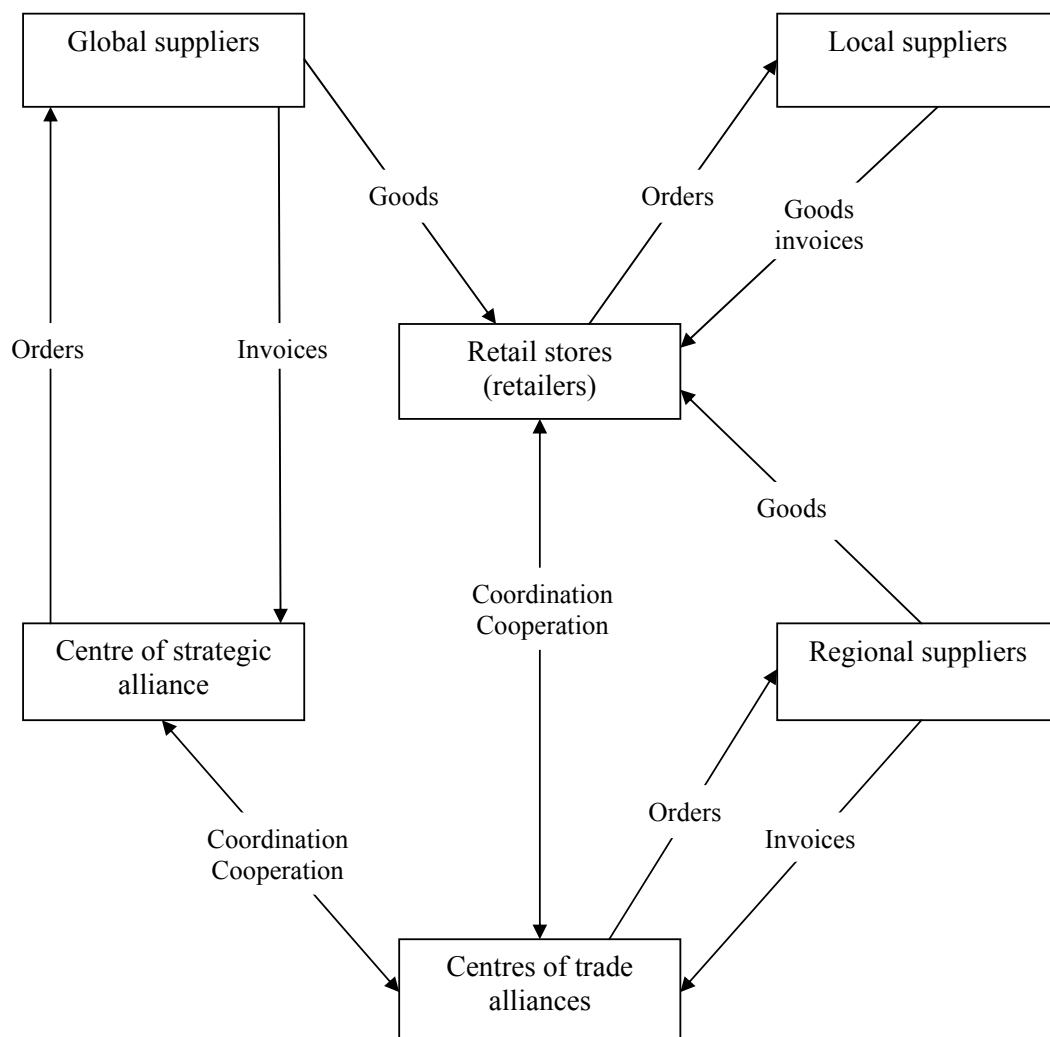
also started to monitor the alliance for efficiency and each other for equity and adaptability. Their learning fed into periodic re-evaluations of the alliance according to these three assessment criteria, which, in turn, led partners to make adjustments to their relationship by moving away from its initial conditions.

26 business subjects focusing on retail sale of fast moving consumer goods including multinational trade chains and independent traders were selected from 50 biggest trade firms according to achieved sales published in Yearbook of Czech and Slovak Trade (2008). Independent trade has almost half portion in the given list of trade firms in number of subjects. However it is necessary to mention there are some groups which are completed from individual small and medium sized retail and sometime even wholesale firms negotiating with not all suppliers like one company. With respect on portion of total sales the situation is however significantly changing. Total sales of all 26 firms are 340 317 millions of CZK and sales of independent trade alliances reach 90 233 millions of CZK which is 26.51 % of total sales in relative form. Development of sales and rank of individual trade alliances in 2001–2007 is presented in Tab. IV.

IV: Development of sales and rank of trade alliances in millions of CZK

Alliance	2002	2003	2004	2005	2006	2007
COOP SD	29 933 (1)	29 471 (1)	29 010 (1)	28 455 (1)	28 905 (1)	27 221 (1)
COOP DISK.	1 065 (14)	1 051 (14)	998 (14)	973 (14)	957 (14)	938 (14)
COOP TIP	1 847 (12)	1 855 (12)	1 917 (11)	2 741 (11)	2 741 (11)	2 475 (11)
COOP TUTY	3 517 (9)	3 448 (9)	3 926 (9)	4 246 (8)	4 458 (9)	4 790 (8)
ČEPOS	7 550 (3)	10 054 (2)	10 100 (3)	10 250 (3)	10 350 (3)	11 000 (3)
Družstvo CBA	8 752 (2)	10 012 (3)	11 175 (2)	11 695 (2)	11 057 (2)	12 437 (2)
Enapo obchodní	5 628 (5)	6 056 (6)	6 056 (6)	6 100 (6)	5 800 (6)	4 500 (9)
Flop south	3 780 (8)	3 925 (8)	3 984 (8)	3 989 (9)	4 389 (10)	3 500 (10)
MS Brněnka	1 600 (13)	1 700 (13)	1 700 (13)	1 700 (13)	1 900 (12)	1 900 (13)
MS Hruška	5 600 (6)	6 600 (4)	6 900 (5)	6 950 (5)	7 350 (5)	8 450 (5)
SPAR Šumava	1 870 (11)	1 930 (11)	1 904 (12)	1 828 (12)	1 880 (13)	1 954 (12)
SVOP	4 483 (7)	5 107 (7)	5 093 (7)	5 000 (7)	5 000 (8)	5 000 (7)
TETA drogerie	2 500 (10)	2 800 (10)	3 400 (10)	3 610 (10)	5 044 (7)	5 503 (6)
VONET CR	6 401 (4)	6 516 (5)	7 199 (4)	7 839 (4)	8 106 (4)	8 768 (4)
Total	84 526	90 525	93 362	95 376	97 937	98 436

Source: Yearbooks of Czech and Slovak trade (2005, 2006, 2008)



3: Model of strategic alliance between independent trade alliances

Source: Elaborated by author

If the system approach will be used for creation of model of strategic alliance between these retail networks, firstly the subjects and relations must be stated. The organizational centre of strategic alliance is necessary to establish in order to gain competitive advantage through common purchase from global suppliers; those are the same suppliers for all trade alliances like members of strategic alliance. Then the regional suppliers (different suppliers for different trade alliances) have to be included, simi-

larly like local suppliers, which are delivering the goods directly to individual retail stores. This is resulting from research have made through interviews with the representatives of given retail cooperative groups. Mostly these independent networks would like to enter the joint collaboration unit, but they never want to become dependent only on several global suppliers. The scheme of the strategic alliance including the subjects and variant flows is illustrated in Fig. 3.

SUMMARY

The main objective of the contribution is proposal of the model of co-operative trade alliance for independent trade alliances with fast-moving consumer goods (FMCG) in Czech Republic. Partial goal is identification of the factors affecting formation of joint co-operative grouping and its structure, eventually definition of entry conditions which should be fulfilled by individual members. The system approach will be used to realize the given objective. This approach appears as the most suitable in consideration of anticipated structure and character of supposed model. The result will be then proposal of model of mutual co-operation between individual trade alliances. The paper focuses on a general theory of strategic alliances, synthesizing the various findings in the literature on alliances from a resource-based view by examining the role of firm resources in strategic alliances. This theory covers four major aspects of strategic alliances: rationale, formation, structural preferences, and performance. As part of the paper, author proposes a typology of inter-partner resource alignment based on the two dimensions of resource similarity and resource utilization, yielding four types of alignment: supplementary, surplus, complementary, and wasteful. Finally, suggested theoretical conclusions are implemented on proposal of model of strategic trade alliance for independent retail networks in Czech Republic.

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REFERENCES

- BARNEY, J., 1991: *Firm resources and sustained competitive advantage*. Journal of Management 17, pp. 99–120.
- BERMAN, B., EVANS, J. R., 2010: *Retail management*. 11th ed. New Jersey: Prentice Hall. ISBN 978-0-13-246550-2.
- CLIQUET, G., HENDRIKSE, G., TUUNANEN, M., 2007: *Economics and management of networks*. 1st ed. Heidelberg: Physica-Verlag. ISBN 978-3-7908-1757-7.
- DOZ, Y., 1996: *The evolution of cooperation in strategic alliances: Initial conditions or learning processes*. Strategic Management Journal 17, pp. 55–84.
- DYER, J., SINGH, H., 1998: *The relational view: Cooperative strategy and sources of inter-organizational competitive advantage*. Academy of Management Review 23(4), pp. 660–679.
- GRANT, R. M., 1991: *The resource-based theory of competitive advantage: Implications for strategy formulation*. California Management Review 33(3), pp. 114–135.
- HAMEL, G., 1991: *Competition for competence and inter-partner learning within international strategic alliances*. Strategic Management Journal 12, pp. 83–103.
- PORTER, M. E., 1998: *Competitive Strategy: Techniques for analyzing industries and competitors – with a new introduction*. 1st ed. New York: Free Press. ISBN 0-684-84148-7.
- PRAHALAD, C. K., HAMEL, G., 1990: *The core competence of the corporation*. Harvard Business Review 68(3), pp. 79–91.
- SKÁLA, Z. et al., 2005: *Yearbook of Czech and Slovak trade 2005*. 1st ed. Praha: České a slovenské odborné nakladatelství. ISBN 80-903401-4-8.
- SKÁLA, Z. et al., 2006: *Yearbook of Czech and Slovak trade 2006*. 1st ed. Praha: České a slovenské odborné nakladatelství. ISBN 80-903401-8-0.
- SKÁLA, Z. et al., 2008: *Yearbook of Czech and Slovak trade 2008*. 1st ed. Praha: České a slovenské odborné nakladatelství. ISBN 978-80-86835-02-08.
- WILLIAMSON, O. E., 1985: *The economic institutions of capitalism*. 1st ed. New York: Free Press. ISBN 0-68-486374-X.

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