

DOES SPEED REALLY MATTER WHEN IT COMES TO ALLIANCE PERFORMANCE ?

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Abstract: This paper explores the long-term partnership benefits of local strategic alliances in the software industry. A structural model of the value continuum is formulated and tested on data from small and midsize enterprises in Germany. Partial Least Squares Analysis is used to investigate the effect-casual-relations between foundation values, i.e. efficiency and effectiveness, and the innovation value. The results of our empirical study show that the innovation value of localized inter-firm networks originates from costs savings and quality improvements. On the contrary, alliance-induced 'speed', measured by an acceleration of the R&D process, improved flexibility and/or shortened delivery time, has no significant impact on the market-based performance. Time-related benefits of alliances stated in literature may be important to maintain competitive parity, but they do support competitive advantage, market development and market penetration. Instead, value is created, among others, via exchange of tacit knowledge and reduction of transaction costs, particularly by a reduction of customer service costs.

Keywords: Local Strategic Networks, Small and Midsize Enterprises, Value Continuum, Software Industry, Partial Least Squares-Analysis.

Introduction

“Though we have many answers to the question: ‘Why do [local] alliances and networks exist’ we have fewer answers to the question: ‘Do [local] alliances and networks really matter when it comes to firm performance?’” [32]. The notion of value is central to understanding organizations in general and to understanding contemporary phenomena, like strategic alliances. However, the currencies and drivers of the network value are difficult to assess using short-term return on investment criteria or stock prices. To capture the long-term partnership benefits of alliances, the innovation value, i.e. the combination of additional competitive advantages, market development and penetration, needs to be evaluated.

Collaboration in strategic alliances or networks has been under discussion in management literature for more than a decade [21,33,39,76]. Strategic alliances are generally characterized as organizational arrangements among two or more enterprises to improve their competitive position and performance by sharing resources [48,54]. Recently, the interest in local strategic alliances has significantly grown in anglo-american management literature. Much of this interest has been generated by the observation of superior performance of certain geographically concentrated US industry sectors, such as clusters in the steel [2] or semiconductor

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industry [65]. In literature it's frequently argued that these firms, many of which are small, perform better because they benefit from intense inter-firm knowledge transfer and flexible inter-organizational arrangements [3]. Saxenian [64] stresses the importance of social solidarity, shared educational and professional experience – best sustained through constant interaction and geographic proximity, as key advantages of localized networks. Other empirical work, on the other hand, has cast doubt on the benefits of geographical proximity when discussing formal information exchanges and contracts [6], so that value creation of local alliances remains unclear.

A conceptual framework to assess value creation in the software industry is the value continuum, which was first introduced by the Economist Intelligence Unit and IBM Global Services (EIU, 1999).

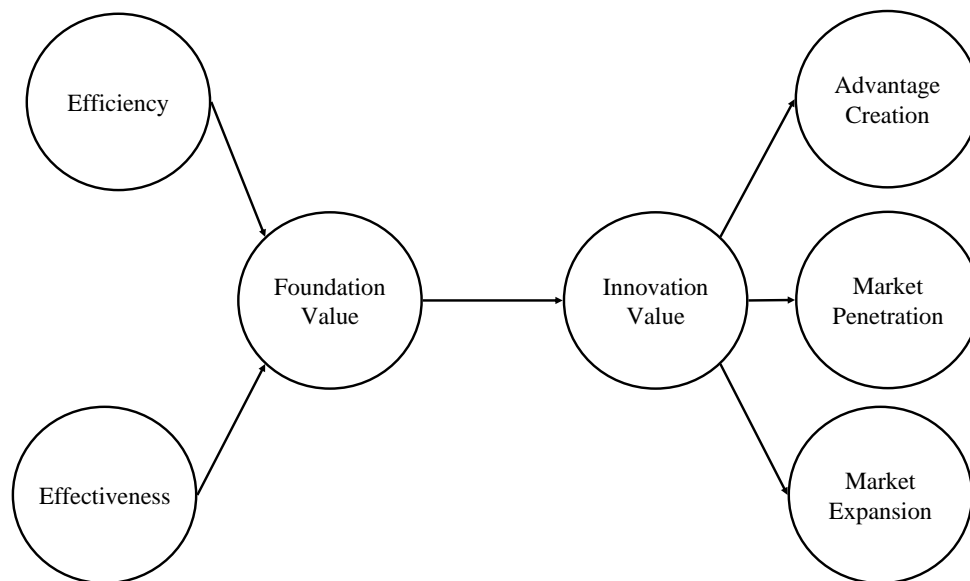


Figure 1. The Value Continuum

The value continuum comprises on the one side the foundation value of strategic alliances, which covers efficiency, the most traditional area of performance enhancement focusing on core productivity goals, such as reducing costs and speeding cycle times. In parallel, the foundation value is determined by effectiveness, which encompasses quality improvements as well as flexibility and other time-related organizational measures, such as time-to-market of product innovations. Both factors combined build the groundwork for the innovation value. It includes advantage creation as well as market penetration and expansion. Thus, the innovation value captures the market-based performance resulting from higher levels of internal efficiency and effectiveness. The value continuum provides an initial framework for analyzing the long-term, multi-level partnership benefits of

strategic networks. Yet, to achieve a deeper understanding of the relationships between foundation and innovation values, it is necessary to align the broad constructs of efficiency and effectiveness along strategic success factors such as costs, quality and time.

The purpose of this study is to investigate whether small and mid-sized enterprises in the software industry benefit from local alliances relative to costs, quality and time and more important, whether these improvements support competitive advantage, market development and penetration. The remainder of the paper is organized as follows: section 2 provides a brief overview of the software sector and a literature review of network types and alliance success factors in the software industry. Section 3 describes the theory and hypotheses underlying the value continuum. In sections 4 and 5, a structural equation model is formulated in and tested on the data of local alliances of small and midsize enterprises in Germany. Our findings are discussed in concluding sections 6 and 7.

Literature review on software alliances

According to the Organization for Economic Co-operation and Development [58] the worldwide market for software and IT-services will grow by 6% in 2006. Despite a few major players in the standard software segment, the software industry as a whole is highly fragmented, consisting mainly of small, niche market entrepreneurial ventures [57]. Estimates for the German market range between 10,000 and 19,000 firms, whose primary business activity is software development. The latter figure includes secondary industries, such as mechanical and electrical engineering as well as the automotive, telecommunications and financial service sector (Friedewald, 2002). The vast majority of these companies are small enterprises, which offer a hybrid of customized software development and third party implementation services. A study by Segelod & Jordan (2004) points out that nearly all software projects are carried out together with one or several external partners. While many motives to engage in inter-organizational alliances, such as economies of scale and scope, access to scarce knowledge and spread of risks, are generic [78], there are some supplementary reasons that are specific to the software sector [73]. One reason is the increasing use of open systems architectures, which by definition demand collaboration among vendors. Another reason is software piracy protection.

Gallant & Graham [28] proposed a classification of alliances in the IT sector based on the complexity of the alliance agreement. The classification ranges from low-level tactical alliances, where one partner endorses another's product or service, to full-scale autonomous alliances, where partner organizations engage in all aspects of product development, marketing and sales. For small and mid-sized enterprises, Torres & Murray [77] explore how software firms utilize different types of networks that range from atomistic to brokered networks. The authors highlight that enterprises follow a progression of network participation.

Empirical findings across industries suggest that alliances in general are relatively short-lived, with many failing to achieve their formal objectives [18]. Other evidence indicates that organizations repeatedly derive major performance benefits, i.e. an increase in stock prices or sales growth following alliance announcements [8]. In contrast, studies on the long-term benefits are rare and often oversimplify the value proposition. Some studies, for instance, consider an alliance's longevity as a benchmark for success [55]. Others measure its contribution to improving the patent rate of allied firms, mostly for large corporations [34]. Closer to the value proposition considered in this paper is a study of Sakar, Echambadi & Harrison [63] investigating the effects of alliance proactiveness on market-based performance, measured in terms of sales growth, market share, market development and product development. Sakar [63] define alliance proactiveness as the extent to which an organization engages in identifying and responding to partnering opportunities. The results show that alliance proactiveness leads to superior performance and that this effect is stronger for small firms in unstable markets. Nevertheless, the investigation is based on a structural measurement model with rather limited explanatory power that focuses on a narrow aspect of strategic management.

A study of Hoffman & Schlosser [36] addresses critical success factors in alliance-making with special consideration given to small and medium-sized enterprises. Their findings indicate that soft facts, such as trust, are important for alliance success (measured by a binary variable of success / failure), but not sufficient on their own. In addition, strategic compatibility and appropriate governance mechanisms have a significant influence on alliance outcome. Furthermore, an exploratory study of Taylor [73] provides an overview of alliance success factors in the software industry. Taylor points out that adaptability and openness of the partners, human resource practices and the learning capabilities during implementation are the most significant factors affecting alliance success (measured by managerial perception). Similar findings were reported by Rai, Borah, & Ramaprasad [60]).

Taken as a whole, a considerable amount of empirical research has accumulated over the last decade that ranges from alliance formation and implementation management to specific performance outcomes of collaborations. Within this context, several studies have attempted to explain the determinants of alliance success or failure. Most of them focus on a specific cause-effect relationship analyzed from a particular theoretical point of view [37]. Usually, such empirical investigations support the underlying theory. However, an analysis that considers the joint influence of various hypothetical factors may lead to different results. To our knowledge no empirical study in literature has analyzed the value creation of networks at an aggregated level and explored if alliance-related improvements in costs, quality and time subsequently result in competitive advantage, market development and penetration.

Value creation in alliances

In literature a number of theoretical perspectives, such as value chain analysis, Schumpeterian innovation, resource-based view of the firm, social network theory and transaction cost economics, exist to operationalize the value proposition and identify sources of value creation [4]. Within the value chain analysis, for instance, value is defined as ‘the amount buyers are willing to pay for what a firm provides them. Value is measured by total revenue ...’ [59,p. 38]. Consequently, Singh & Mitchell [70] evaluate initial and annual sales and growth rates to examine the growth dynamics of inter-firm collaborations in the software industry. Their analysis indicates that strategic alliances in the software industry contribute to superior long-term performance (measured in terms of sales) which in turn attracts more partners. The resource-based view, on the other hand, advocates that a firm’s resources and capabilities ‘are valuable if, and only if, they reduce a firm’s costs or increase its revenues compared to a situation where the firm may not have possessed the appropriate kinds of resources’ [7, p. 148]. Others use a broader value concept, which also includes non-monetary revenues. Within this context Jones [41] describes different strategic alliance value concepts based on utility theory and other marketing-related literature.

Innovation Value

According to the value continuum the long-term benefits of an alliance can be conceptualized as the innovation value [72], whereby such a multi-dimensional construct is difficult to quantify. Thus, the following analysis observes the impact of strategic alliances on the focal firm’s market-based performance as a latent variable that is not directly measurable and is described by several empirically determined indicator variables.

In line with the value continuum our study considers an ‘increase in sales resulting from market development’, ‘additional competitive advantages’ and ‘market penetration due to the offer of a comprehensive and differentiated product portfolio’ as key indicators of the innovation value of local strategic alliances.

Drivers of the innovation value

Strategic management research has explored a multitude of critical factors that have a significant impact on the market-based performance. To allow a structured comparison of different paradigms, we refer to the traditional success factors of costs, quality and time [47].

HYPOTHESIS 1: (A,B,C) The innovation value of a local strategic alliance is positively related with the strategic success factors ‘costs’, ‘quality’ and ‘time’.

Cost Effects

Efficiency measures, especially cost reductions, are one of the most important value drivers for small to midsize enterprises and are at the core of many alliance strategies [36]. Narula & Hagedoorn [56], for instance, categorize ‘cost-economising’ as one of the prime motives for entering an alliance. From the perspective of transaction costs economics, it is necessary to determine why such an organizational form would have a cost advantage over the market or hierarchical

organization of operation for a specific type of activity to identify the efficiency-related benefits of strategic alliances [81]. The following empirical analysis focuses on the specific activities of R&D, operations and service to capture the cost advantage of local alliances.

Additionally, the issue of resource utilization is important in the resource-based view of the firm since the ability of firms to utilize resources is a key indicator of their competitive capabilities [51]. A higher workload allows each partner to proceed faster on their individual learning curve [35]. Such effects depend on how partners agree to share their individual resources, as measured by an uphold or increase in resource utilization [20].

Combining both theoretical perspectives we consider an 'uphold/increase in workload', 'reduction of costs in research and development', 'reduction of employed resources in the operations process' and/or 'reduction of customer service costs' as the key manifestations of the cost advantage of local alliances.

Quality Effects

Apart from efficiency goals, alliances are founded on effectiveness measures that primarily involve quality improvements. This is particularly true for small and mid-sized enterprises that pursue a niche strategy [57]. In the highly fragmented software industry, for instance, alliances with a differentiation focus are formed to create system solutions by combining specialized assets that entail complementary products and platforms provided by other niche players [31].

In information systems literature, software quality is often differentiated by a product and service dimension [44,69,79]. Collaboration in strategic networks can affect these two dimensions in various ways. Alliance agreements, for instance, frequently define product quality in terms of standards, such as the 'Software product Quality Requirements and Evaluation' (SQuaRE), which covers a software quality model, a measurement reference model, quality requirements, and the software product quality evaluation (ISO/IEC, 2005). These standards ensure a minimum quality level and a harmonized quality management approach. Furthermore, sharing competences within alliances allows the partners to fill gaps in the service-portfolio. Via collaboration, each partner can offer its customers a broader range of competencies and subsequently improve customer service quality. Furthermore, resource quality constitutes another quality-related alliance success factor. According to the knowledge-based theory of inter-firm collaboration [30], strategic networks that effectively transfer knowledge are likely to outperform competitors. A distinction is made between two types of knowledge, i.e. explicit knowledge (information) and tactical knowledge (know-how) [46]. Grimaldi & Torrisi [31] furnish examples for codification and knowledge-transfer in software alliances. Matusik & Heely [52] explore the different dimensions of absorptive capacity in the software industry. The authors show that absorptive capacity is composed of multiple dimensions: (i) the firm's relationship to its external environment; (ii) the structure, routines, and knowledge base and (c) individuals' absorptive abilities.

Integrating the quality perspective and knowledge-based view we consider a 'gain of know-how', 'improvement of product quality' and/or 'enhancement of service quality' as key indicators of the quality advantage of local strategic alliances.

Time Effects

According to management literature, speed is another critical success factor, in particular in fast-paced industries, such as the software sector. It's a complementary source of value creation in alliances that combines efficiency (e.g. delivery time) and effectiveness measures (e.g. flexibility). Yasuda [83] points out that access to resources is the primary motive to form alliances, followed by shortening of the time required for R&D and marketing. Similar findings are reported by McCutchen & Swamidass [53] in the pharmaceutical industry, indicating that small firms are more likely motivated by a reduction in the R&D time-span than larger firms seeking strategic alliance. Blackburn, Scudder, & van Wassenhove [9] provide an overview of time-based software development. Gerwin & Ferris [29] identify potential benefits and costs of project organization options in alliances, considering high and low time-to-market pressures. Corresponding to the theory of dynamic capabilities [74], two critical matters for competitive advantage can be identified, i.e. time-to-market and time-to-delivery [45]. In customized software development, time-to-market covers the time span of a software solution from the date that it is initially ordered to acceptance by a customer. Time-to-delivery includes, by contrast, the time needed for updates, maintenance or other service-related issues. Being a partner in an alliance can result in various speed advantages. Benefits can be achieved by combining complementary know-how within the bounds of the network, especially in the area of R&D. Each enterprise does not need to develop distinctive capabilities in a time consuming research process.. Joint use of resources and parallel processes also achieve shorter delivery times [71]. Flexibility is another important time-related strategic success factor. Faced with greater environmental uncertainty, small and mid-sized firms favor more variable, less binding relationships, such as alliances. Flexibility can generally be defined as the ability to adapt to environmental changes [1], whereby Das & Teng [19] identify flexibility as one of the key advantages of alliances. Young-Ybarra & Wiersema [84] provide an overview of the determinants of flexibility in IT alliances, derived from transaction costs economics and social exchange theory.

In summary, an 'acceleration of research and development processes', 'more timely consideration of customers' requirements' and/or 'faster and more flexible reaction to changed terms of competition' are considered as key manifestations of the time advantage in local strategic alliances.

Cause-effect relationship model

The path model in figure 2 summarizes the hypothesized cause-effect relationships for the latent construct 'innovation value' and the effects of costs, quality and time as strategic success factors. Hypotheses 1 describes the presumed relations among

latent variables (inner path model). Furthermore, each latent variable's manifest indicators (outer measurement models) is described.

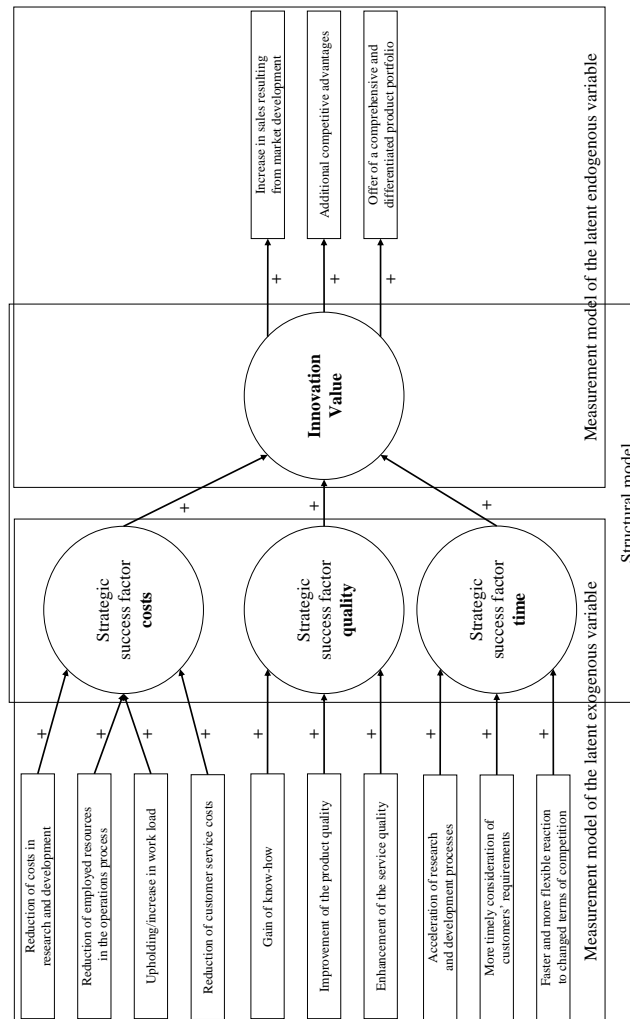


Figure 2. Innovation Value Path Model

The structural model explains 'innovation value' in terms of the positive effects of the critical success factors 'costs', 'quality' and 'time' caused by an enterprise's participation in a local alliance. The approach incorporates both formative and reflective measurement models [26,75]. The latent endogenous variable 'innovation value' has a reflective measurement model (effect indicators). Formative measurement models (cause indicators) are used for the latent exogenous factors 'costs', 'quality' and 'time' [11]. Hence, 'innovation value' represents the underlying principal factor in the model that correlates with an

'increase in sales resulting from market development', 'additional competitive advantages' and 'market penetration due to the offer of a comprehensive and differentiated product portfolio'. The value drivers, on the other hand, are operationalized as indices produced by observable variables. This kind of hybrid design permits comparison of the relative importance of the specific cause-effect relationship described in the literature review.

Research design and sample description

The hypothesis was tested on data from small and mid-sized enterprises in the German software sector, i.e. companies with less than 250 employees, € 40 MN (million) in maximum, annual turnover or balance sheet sum of € 27 MN, which are not to 25% or more owned by large corporations (EU Bulletin No. C 213, July 23, 1996) and whose primary business activity is software development. Using secondary sources in the public domain (AMADEUS database, industry reports and websites) and the above selection criteria an initial list was compiled, comprising 600 randomly chosen small and mid-sized software enterprises. By preliminary correspondence and telephone contacts the authors were able to identify 80 firms that participate in local alliances, defined in terms of a geographical proximity of less than 100 miles, and were willing to take part in the study. Due to the focus on local software alliances, the study uses a relatively homogeneous sample which controls for other external factors that might impact the relationships investigated.

Before constructing the survey instrument, exploratory semi-structured interviews on the value continuum were conducted with 10 managers. The extracted themes were used to complement and modify the items developed from literature review, resulting in a questionnaire containing 124 statements to reflect the environment and key success factors of alliances. Subsequently, data from the companies were collected with a standardized survey, whereby only fully answered questionnaires of 63 companies were included to analyze the causal model with PLS. Such a dual data collection approach has been used by other researchers analyzing strategic alliance and is advocated for ill-structured and complex problems [60,73]. Next to general background information the respondents were asked to rate each strategic success factor item on a five-point Likert scale to what extent the local alliance has met its objectives. Analogous the perceived alliance success with respect the items 'increase in sales resulting from market development', 'additional competitive advantages' and 'market penetration due to the offer of a comprehensive and differentiated product portfolio' was measured using a five-point Likert scale. Finally, the possibility of a non-response bias was examined, by comparing the first and last wave of respondents on all examined variables using a t-test [5]. There were no statistically significant differences ($p < 0.01$), which implies no systematic non-response bias that would effect the results. (see Table A.2 appendix).

The vast majority of the surveyed enterprises are small, privately-owned ventures that have existed for more than ten years (77%). Given the focus on local strategic

alliances, most software firms in the sample target a regional market (14%) or the national market (45%). Despite the firm's longevity and domestic focus, strategic alliances contribute over 25% to annual sales in more than $\frac{1}{3}$ of the investigated cases. These numbers demonstrate the importance of local alliances for small and mid-sized software enterprises even though the majority still relies heavily on their individual product and service-portfolio for bottom-line profits. Firms that cooperated in our study primarily form local alliances in the areas of marketing/sales (39%), customer service (25%) and R&D (18%). Collaborative software development processes (11%) and administrative functions (7%), on the other hand, are relatively rare. Hoffmann & Schlosser [36] have reported similar findings for small and mid-sized enterprises in other industries. Local marketing/sales alliances operate on a largely informal, i.e. case-to-case, basis and consist on average of 4.2 partners, while customer service and R&D collaborations are predominantly long-term contractual alliances that focus on just one partner (39%). The high number of low-level tactical alliances can be explained by the fact that software firms give high priority to protecting their proprietary knowledge. Another reason could be risk aversion by managers who favor more flexible alliance arrangements. Consequently, in most networks each partner either has its own independent sphere of specialization (45%) or is controlled by just one enterprise (32%), while only 23% of the local alliances are jointly managed by the partners. In terms of the degree of hierarchy and transactions dependency, the first option provides the advantage of lower transaction costs but makes a smaller contribution to network formation and organizational learning [29]. Thus, one would expect that knowledge transfer plays an inferior role in the software alliances that we surveyed.

Model estimation and evaluation of results

Structural equation modeling and path modeling with latent variables allow estimating complex cause-effect relationships [27,66]. In this context Covariance-Based Structural Equation Modeling [CBSEM,11;42] and Partial Least Squares Analysis [PLS,49;82] constitute two corresponding, yet distinctive statistical techniques for assessing cause-effect relationship models with latent variables.

In this study, we chose PLS, which generalizes and combines features from Principal Component and Multiple Regression Analysis, for three reasons: (1) outer measurement operationalization, (2) distributional assumptions, and (3) sample size. It is important to distinguish between formative (cause) and reflective (effect) measurement of latent variables from a theoretical perspective [10,11,23]. Value drivers, like the latent variables in our path model, typically employ independent cause indicators [22]. Even though a formative operationalization is principally possible in CBSEM [12,43,50], applications usually employ only reflective measurement to ensure model identification [40]. PLS explicitly considers the formative mode in its algorithm [49] and, thus, does not share the methodological problems of CBSEM for this kind of operationalization. CBSEM

requires multivariate normally distributed observed variables [61]. Empirical analyses often do not comply with this assumption, especially when success factors are involved. The non-parametric PLS approach does not involve certain distributional assumptions and is – as simulation studies show [16,80] – very robust regarding varying sample sizes. The latter is also important for the choice of PLS for our analysis. While CBSEM requires several hundred observations for reliable model estimates, this number is significantly lower in PLS and, thus, the number of observations in our study allows for reliable path model estimations [15,16]. We use the statistical software application SmartPLS 2.0 [62] to estimate the path model with empirical data. The causal model and the measurement results are summarized in figure 3.

Our empirical findings show that time-related benefits of local software alliances may be important to maintain competitive parity but do not considerably support competitive advantage, market development and penetration. Instead, value is created in localized alliances through quality improvements and costs savings. A model evaluation [14] is required to assess the reliability of these results (see Table A.1 appendix).

Evaluation of the Inner Path Model

The goodness of fit R^2 of the latent endogenous variable ‘innovation value’ constitutes the central criterion for evaluating the structural model. The three strategic success factors ($R^2 = 0.633$) explain a substantial amount of the variance in the ‘innovation value’, which is measured in terms of an ‘increase of sales resulting from market development’, ‘additional competitive advantages’ and ‘market penetration due to the offer of a comprehensive and differentiated product portfolio’. The factor ‘quality’, with a weight of 0.375, expresses the largest explanatory share, while the weight of the success factor ‘costs’ (0.338) is slightly lower. In contrast, the success factor ‘time’ (0.193) makes the smallest contribution explaining the innovation value.

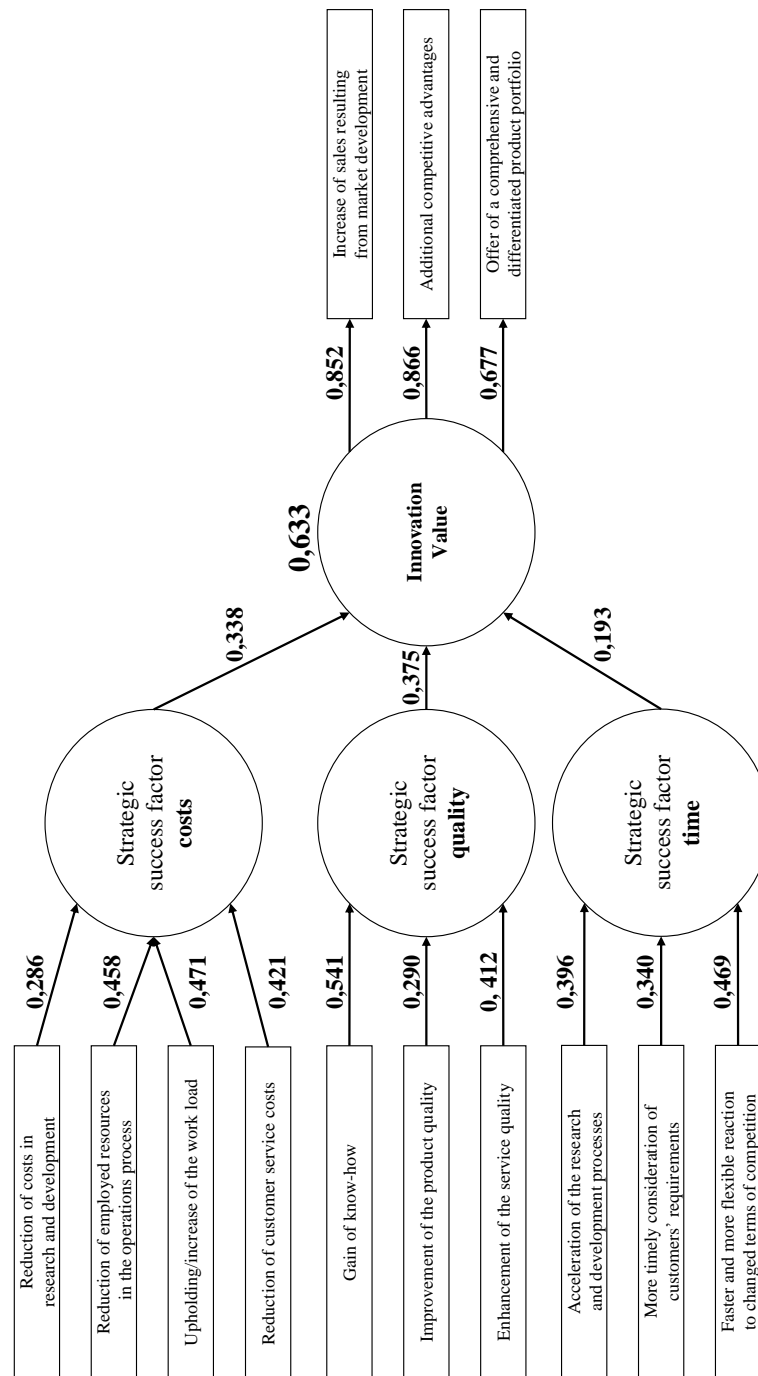


Figure 3. Results Of Pls Path Model Estimation

Additionally, the significance of the interrelations between the strategic success factors and the ‘innovation value’ needs to be evaluated using resampling techniques [75]. A bootstrapping procedure [24] allows to conduct t-tests revealing that the strategic success factors ‘costs’ and ‘quality’ have a statistically significant positive effect on the innovation value ($p < 0.01$), while a statistically significant relationship could not be shown for the success factor ‘time’ (Table 1).

Table 1. Inner Path Model Coefficients and their Significance

Latent exogenous variable	Original value	Mean (bootstraps)	Standard deviation	T-value
Effects of the strategic success factor costs	0.3380	0.3213	0.1262	2.68***
Effects of the strategic success factor quality	0.3750	0.3648	0.1364	2.75***
Effects of the strategic success factor time	0.1930	0.2527	0.1164	1.66†
† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$				

For a more detailed analysis, computation of the effect-size f^2 approximates the predictive power of the three constructs on the innovation value. Relative changes in the goodness of fit R^2 if the analyzed latent exogenous variable in the structural model is excluded and included define the effect-size. According to Chin [14], f^2 -values of 0.02, 0.15 and 0.35 specify whether latent exogenous variables have a small, medium or large effect-size. In compliance with the preceding results, the strategic success factors ‘costs’ (0.1798) and ‘quality’ (0.1253) have a medium effect at the structural level, while the effect-size of the factor ‘time’ (0.0436) is small (see Table A.3 appendix).

The predictive relevance Q^2 constitutes another criterion for the structural model assessment. It is computed using blindfolding procedures, with a value larger than zero, which indicates that the latent exogenous variables have predictive relevance for the latent endogenous variable [14]. In the structural equations model, the Q^2 (0.318) is clearly above zero, so that the model has predictive relevance. Alongside with the effect-size f^2 the predictive relevance q^2 can be calculated for each latent exogenous variable. In the structural model, the success factors ‘costs’ (0.0557), ‘quality’ (0.0587) and ‘time’ (0.0095) have a fairly low predictive relevance, i.e. the innovation value is not substantially determined by a specific latent exogenous variable; rather it is determined by the combination of success factors.

Our empirical results strongly support hypotheses 1a and 1b, i.e. that the innovation value of a local strategic alliances is positively related with the strategic success factors ‘quality’ and ‘costs’, while the support for hypothesis 1c (time) is mixed. A statistically significant relationship between the success factor ‘time’ and

the 'innovation value' could not be shown, given the joint influence on the market-based performance.

Evaluation of the Reflective Measurement Model

In the structural equations model, the construct 'innovation value' is operationalized by the indicators 'increase of sales resulting from market development' (0.852), 'additional competitive advantages' (0.866) and 'market penetration due to the offer of a comprehensive and differentiated product portfolio' (0.677). The factor loadings reflect the power of the interrelations between the 'innovation value' and its indicators. The first two factor loadings have a high value, while the third indicator 'market penetration' is above the minimum value of 0.5 demanded in literature for reliability [17]. Thus, the 'innovation value' explains the variance of each indicator to a large extent (see Table A.4 appendix). The composite reliability ρ_C and the average variance extracted represent two additional measures that are used to measure reflective measurement-models when applying PLS. Composite reliability ρ_C indicates the internal consistency of the in the latent construct. Its empirical value is 0.843, which is above the threshold of 0.6 (Chin, 1998). The same is true for the average variance extracted from the manifest indicators which has a value of 0.644 [14].

Evaluation of the Formative Measurement Model

We employed formative measurement models to measure the success factors in the structural equations model. A test of significance of the interrelations between the manifest and latent variables was performed by applying the bootstrapping procedure [13,24] see Table 2.

The indicator variable 'uphold/increase of the work load' has the highest weight (0.471) for the formative measurement of the success factor 'costs'. The variables 'reduction of employed resources in the production process' (0.458) and 'reduction of customer service costs' are also highly relevant (0.421). All three indicators additionally evidence high significance at the $p < 0.001$ level. The smallest explanatory power for the success factor 'costs' is expressed by the variable 'reduction of costs in research and development' at a weight of 0.286. A statistically significant relationship at the $p < 0.05$ level could not be shown. In summary, an 'uphold/increase in workload', 'reduction of employed resources in the operations process' and 'reduction of customer service costs' lead to a cost advantage. Potential savings in R&D expenses, on the other hand, play an inferior role for the success of local alliances that we investigated.

In terms of the success factor 'quality', the manifest indicator 'gain of know-how' (0.541) has the highest influence on the latent variable, followed by 'enhancement of the service quality' (0.412) and 'improvement of the product quality' (0.290). However, a statistically significant relationship at the $p < 0.05$ level could not be shown for 'improvement of the product quality'. Only a 'gain of know-how' and 'enhancement of service quality' result in a quality-advantage of local strategic alliances.

Table 2. Outer Weights of Formative Indicator Variables and their Significance

Indicators in the formative measurement models	Original value	Mean (bootstraps)	Standard deviation	T-value
Costs				
Reduction of research and development costs	0.2862	0.2807	0.1425	2.01*
Reduction of resources employed in the operations process	0.4576	0.4518	0.1647	2.78**
Uphold/increase in work load	0.4712	0.4628	0.1455,	3.24**
Reduction of customer service costs	0.4212	0.3790	0.1546	2.72**
Quality				
Gain of know-how	0.5412	0.5088	0.1579	3.43***
Improvement of product quality	0.2904	0.3214	0.1788	1.62
Enhancement of service quality	0.4119	0.3801	0.1300	3.17**
Time				
Acceleration of research and development processes	0.3396	0.3472	0.2025	1.68†
More timely consideration of customers' requirements	0.4694	0.5026	0.2281	2.06*
Faster and more flexible reaction to changed terms of competition	0.39633	0.3394	0.1454	2.73**
† p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001				

The indicator 'more timely consideration of customers' requirements' has the highest explanatory power (weight of 0.469) for the formative measurement of the success factor 'time'. The relations to the manifest variables 'faster and more flexible reaction to changed terms of competition' (0.396) and 'acceleration of research and development processes' (0.340) are slightly lower. All three variables are significant at a $p < 0.05$ level.

Due to the applied principles of the multiple regression for calculating formative measurement models, it is necessary to conduct a test of multicollinearity, measured by the tolerance of variance inflation [22]. Looking at the empirical results for the formative measurement models of the latent variables 'costs', 'quality' and 'time', the highest variance inflation value is 2.069. This value is far below the critical value of ten. Multicollinearity is subsequently not at a critical level in the formative measurement models (see Table A.5 appendix).

Evaluation of the formative measurement models reveals that – except for the 'reduction of costs in research and development' and 'improvement of the product quality' – the theoretically deduced variables are well suited as indicators of the

strategic success factors 'costs', 'quality' and 'time', which subsequently result in higher long-term market-based performance. A result which likewise applies to content specification, index specification and indicator collinearity [22]. Implications of these findings will be discussed in the concluding section. But before doing so, the limitations of our study are discussed.

Limitations

Our findings are subject to several limitations. First, we suggest caution in generalizing the findings to local alliances that operate in different geopolitical and economic environments. Our survey-weighted estimates are specific to the subpopulation of the German software industry, which is characterized by incremental innovations, a low degree of standardization and defensive growth orientation [25]. Other results may apply to software firms that follow an 'Entrepreneurial Business Model', as in the case of many US ventures. Second, causal interpretations of the relationships between success factors and the innovation value are asserted with caution since the variables used to measure the constructs were collected with the same instrument at a certain point of time. The robustness of the results can only be validated by replicating the findings for the same subpopulation at different time periods. Last, the sample size is small. Although the sample replicates the general structure of the software industry and the PLS-approach can be applied to small populations, a larger database could lead to more robust results.

Summary

This study was conceptualized to investigate whether small and mid-sized enterprises in the software industry benefit from local alliances regarding costs, quality and time and whether these improvements support competitive advantage, market development and penetration. Our empirical results show that the innovation value of localized inter-firm networks primarily originates from costs savings and quality improvements. The time-related benefits of local software alliances have no significant impact on the market-based performance. Although R&D and marketing speed [83] as well as flexibility aspects [84] are frequent motives to form alliances, they are not associated with value creation, at least in local alliances in the software industry. Overall, about $\frac{2}{3}$ of the variance in the innovation value of local alliances can be explained by traditional success factors. This is quite high considering that specific issues of the alliance implementation process, such as human resource practices [60,73] and other important aspects, like trust [67], were not included in this study that is based on the value continuum framework.

In literature, several studies attempt to explain the determinants of alliance success. Most of them focus on a specific cause-effect relationship analyzed from a particular theoretical perspective. The universal framework of the value continuum provides support for both transaction costs economics and the resource-based view as equally important foundations of value creation in local alliances.

Quality improvements, and especially cost savings, are both rooted in these theories. Surprisingly, the impact of the ‘gain in know how’ on the success factor quality is high, although most of the investigated alliances are low-level tactical alliances that do not support extensive knowledge transfer. Even in such an environment, the knowledge-based theory holds considerable promise for exploring the role of alliances in gaining competitive advantages. Overall, the analysis of value creation in local software alliances was performed at an aggregated level, allowing a comparison of different paradigms. Based on the findings, future studies may conduct more detailed investigations of specific effect-cause relationships. The universal framework of the value continuum also permits a comparison of different industries and types of networks. The above insight has implications not only for alliance theory but also for managers of small and midsized enterprises in terms of their choices of alliance partners and structures.

Appendix

Table A.1. Measures to Evaluate PLS Path Modeling Results [14]

Criterion	Description
	Evaluation of the structural model
R ² of latent endogenous variables	R ² -results of 0.67, 0.33 and 0.19 for latent endogenous variables in the structural model are describe as ‘substantial’, ‘moderate’ and ‘weak’.
Estimates for path coefficients	The estimated values for path relationships in the structural model should be at significant levels. This significance can be evaluated using the bootstrapping procedure.
<i>f</i> ² for the effect size	$f^2 = \frac{R_{included}^2 - R_{excluded}^2}{1 - R_{excluded}^2}$ <i>f</i> ² -values of 0.02, 0.15 and 0.35 can be viewed as a gauge for whether a predictor latent variable has a weak, medium or large effect at the structural level.
Prediction relevance (Q ² and q ²)	$Q^2 = 1 - \frac{\sum_D E_D}{\sum_D O_D}$ The blindfolding procedure is processed to calculate Q ² . D is the omission distance, E is the sum of squares of prediction errors and O is the sum of squares of observations. Q ² values above zero evidence that the observed values are well reconstructed and that the model has predictive relevance (Q ² values below zero indicate a lack of predictive relevance). In keeping with <i>f</i> ² , the relative impact of the structural model on the observed measures for latent dependent variables can be assessed as follows:

	$q^2 = \frac{Q_{\text{included}}^2 - Q_{\text{excluded}}^2}{1 - Q_{\text{excluded}}^2}$
Evaluation of reflective measurement models	
Factor loadings	Factor loadings should be higher than 0.7.
Composite reliability (ρ_c)	$\rho_c = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum_i \text{var}(\varepsilon_i)}$, where λ_i is the component loading to an indicator and $\text{var}(\varepsilon_i) = 1 - \lambda_i^2$. The composite reliability as a measure of internal consistency should be higher than 0.6.
Average variance extracted (AVE)	$\text{AVE} = \frac{\sum \lambda_i^2}{\sum \lambda_i^2 + \sum_i \text{var}(\varepsilon_i)}$, where λ_i is the component loading to an indicator and $\text{var}(\varepsilon_i) = 1 - \lambda_i^2$. The average variance extracted should be higher than 0.5.
Discriminate validity	The extracted average variances of the latent variables should be greater than the square of the correlations among the latent variables. This indicates that more variance is shared between the latent variable component and its block of indicators than with another block representing a different block of indicators. Cross-loadings are another test of discriminate validity. It is expected that each block of indicators load higher for its respective latent variable than indicators for other latent variables. If an indicator has a higher correlation with another latent variable, then the appropriateness of the model may be reconsidered.
Evaluation of formative measurement models	
Significance of weights	Estimates for formative measurement models should be at significant levels. This significance can be evaluated using the bootstrapping procedure.
Multicollinearity	Manifest variables in a formative block must be tested for multicollinearity. The variance inflation factor (VIF) may be used for such tests. Values that are higher than ten reveal a critical level of multicollinearity and the measurement model must be reconsidered.

Table A.2. Descriptive Statistics

	Support of strategic goals by local cooperation					n	Arithmetic mean	Standard deviation
	low	↔						
Reduction of research and development costs	26	7	9	14	7	63	2.51	1.49
Reduction of resources employed in the operations process	20	3	18	14	8	63	2.79	1.43
Upholding/increase of the work load	7	7	15	18	16	63	3.46	1.29
Reduction of customer-service-costs	26	12	10	9	6	63	2.32	1.39
Gain of know-how	8	9	15	15	16	63	3.35	1.35
Improvement of product quality	15	10	11	17	10	63	2.95	1.43
Enhancement of the service quality	20	7	11	13	12	63	2.84	1.54
Acceleration of research and development processes	28	12	9	9	5	63	2.22	1.36
More timely consideration of customers' requirements	10	4	16	15	18	63	3.43	1.39
Faster and more flexible reaction to changed terms of competition	10	5	18	11	19	63	3.38	1.41
Increase of sales resulting from market development	8	10	19	11	15	63	3.24	1.33
Additional competitive advantages	6	9	17	12	19	63	3.46	1.32
Market penetration due to the offer of a comprehensive and differentiated product portfolio	12	6	13	15	17	63	3.30	1.46

Table A.3 Outer Weights of the Latent Exogenous Variables

Latent exogenous variable	R ² (included)	R ² (excluded)	Effect-size <i>f</i> ²
Effects on the strategic success factor costs	0.633	0.567	0.180
Effects on the strategic success factor quality	0.633	0.587	0.125
Effects on the strategic success factor time	0.633	0.617	0.044

Table A.4 Outer Loadings of the Latent Endogenous Variable and their Significance

	Original value	Mean (bootstraps)	Standard deviation	T-value
Increase of sales resulting from market development	0.8518	0.8730	0.0318	26.7762***
Additional competitive advantages	0.8661	0.8987	0.0249	34.7645***
Market penetration due to the offer of a comprehensive and differentiated product portfolio	0.6766	0.6686	0.0963	7.0233***

† p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001

Table A.5 Evaluation of Multicollinearity in Formative Measurement Models

Indicators in the formative measurement models	Tolerance	Variance inflation factor
Costs		
Reduction of research and development costs	0.976	1.024
Reduction of resources employed in the operations process	0.767	1.304
Upholding/increase in work load	0.858	1.165
Reduction of customer service costs	0.898	1.114
Quality		
Gain of know-how	0.754	1.326
Improvement of the product quality	0.602	1.660
Enhancement of the service quality	0.669	1.495
Time		
Acceleration of research and development processes	0.511	1.957
More timely consideration of customers' requirements	0.483	2.069
Faster and more flexible reaction to changed terms of competition	0.763	1.310

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CZY SZYBKOŚĆ MA ZNACZENIE W PRZYPADKU EFEKTYWNOŚCI ALIANŚÓW?

Streszczenie: W poniższym artykule zbadano czy długoterminowe partnerstwo przynosi korzyści lokalnym aliansom strategicznym w branży oprogramowania. Sformułowano strukturalny model ciągłości wartości i sprawdzono go na danych z małych i średnich przedsiębiorstw w Niemczech. Wykorzystano analizę cząstkową najmniejszych kwadratów w celu sprawdzenia przypadkowych relacji między przyjętymi danymi, np. wydajność i skuteczność oraz wartość innowacji. Wyniki naszych badań empirycznych pokazują, że wartość innowacji zlokalizowanych sieci wewnątrz firm wywodzą się z chęci uzyskania oszczędności i podniesienia jakości. Z drugiej strony, narzucona przez alians *szybkość*, mierzona jako przyspieszenie badań, zwiększyła elastyczność i/lub skróciła czas dostawy, ale nie ma istotnego wpływu na efektywność związaną z rynkiem. Korzyści związane z czasem dotyczące aliansów prezentowane w literaturze mogą być istotne dla utrzymania paritetu konkurencyjności, ale nie wspierają one przewagi konkurencyjności, rozwoju rynku i penetracji rynku. Zamiast tego tworzona jest wartość poprzez wymianę cichej wiedzy i redukcję kosztów transakcji, zwłaszcza przez redukcję kosztów obsługi klienta.

当谈到联盟绩效时，速度是否真的重要？

摘要：本文探讨了保持本地的软件产业战略联盟的长期合作伙伴关系的好处。一个统一的价值结构模型已经形成，并且已经运用其对德国中小企业进行了数据测试。偏最小二乘法是用来研究基础值变化之中的因果关系即效率和成效，以及创新价值的关系。我们的实证研究表明本地企业创新价值来源于削减成本和质量的改。