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CONFIGURATIONS OF RESOURCES AND CAPABILITIES AND THEIR PERFORMANCE IMPLICATIONS: AN EXPLORATORY STUDY ON TECHNOLOGY VENTURES

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As one of the most widely accepted theoretical perspectives in strategy, the resource-based view (RBV) suggests that a firm's resources underlie its ability to achieve competitive advantage. However, much of the extant work in this stream has examined the characteristics that resources must have in order to yield rents, while efforts to specify the crucial link between resources and value creation have been sparse. As a consequence, current theory is not sufficiently clear on how different kinds of resources and capabilities contribute to performance, nor does it clarify how firms can combine different resources and capabilities to achieve superior performance outcomes. Analyzing data obtained from 230 technology ventures with partial least squares (PLS) structural equation modeling and cluster analysis, this study seeks to improve understanding of the resource-performance link in two main ways. Based on a careful measurement of resources and capabilities in a well-defined functional area (sales and distribution), we first show how these resources and capabilities contribute to performance in that functional area. Second, we identify four clusters of firms that deploy different configurations of resources and capabilities. Among the four configurational solutions, two are associated with superior (equifinal) performance outcomes.

INTRODUCTION

As one of the most widely accepted theoretical perspectives in the field of strategy, the resource-based view (RBV) suggests that a firm's resources and capabilities underlie its ability to achieve competitive advantage (Penrose, 1959; Barney, 1991; Helfat and Peteraf, 2003). Over the last quarter century, a large body of theoretical and empirical work has helped to shape our understanding of how firms' resources and capabilities lead to differences in firm performance (e.g., Wernerfelt, 1984; Amit and Schoemaker, 1993; McGrath, MacMillan, and Venkataraman, 1995; Miller and Shamsie, 1996; Afuah, 2002; Danneels, 2007; Gruber, MacMillan, and Thompson, 2008).

Yet, although the RBV has become a valuable perspective from which to describe why some

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firms outperform others, critics have observed that the RBV is often tautological, offers little normative guidance, and does not predict *ex ante* which resource deployment strategies are likely to be effective (Priem and Butler, 2001; Sheehan and Foss, 2007; Sirmon, Hitt, and Ireland, 2007). In fact, much of the conceptual and empirical work in this stream of research has focused on the characteristics that resources must have in order to yield rents (such as being rare and inimitable, cf. Barney, 1991), while attempts to specify the link between resources and value creation have been sparse (Sheehan and Foss, 2007; Sirmon *et al.*, 2007). As a consequence, current theory is not sufficiently clear concerning how different kinds of firm resources and capabilities contribute to performance, nor on how firms accumulate and configure their resources and capabilities to achieve superior performance (Black and Boal, 1994; Miller and Shamsie, 1996; Sheehan and Foss, 2007). Unfortunately, these shortcomings also limit the usefulness of the RBV as a prescriptive tool for managerial practice. For instance, Priem and Butler (2001) noted that '(s)imply advising practitioners to obtain rare and valuable resources in order to achieve competitive advantage and, further, that those resources should be hard to imitate and non-substitutable for sustainable advantage, does not meet the operational validity criterion. [. . .] RBV studies from this approach would likely be more helpful if the key underlying constructs were carefully defined and the specific mechanisms purported to generate competitive advantage carefully detailed' (Priem and Butler, 2001: 31/34).

This paper seeks to improve understanding of the resource-performance link in two primary ways. First, we carefully measure resources and capabilities in a well-defined functional area (sales and distribution) and show how they contribute to performance in that area. This approach allows us to trace a clearer trail of logic from the firm's resources and capabilities to performance outcomes and also helps to clarify the relative contributions of different types of resources and capabilities to performance. Second, since resources and capabilities are usually deployed in bundles to perform particular functions, we explore how bundles of resources and capabilities are configured in the sales and distribution function and determine how these configurations are associated with different performance outcomes.

The empirical context of our study is young technology firms. We chose these types of firms because extant research suggests that they vary significantly in their ability to perform sales and distribution activities, and that these activities have an important effect on their performance (Roberts, 1991). In addition, young firms are typically less complex than more established firms, so they provide a comparatively clean setting for an empirical exploration of the effect of resources and capabilities. For these purposes, we analyzed the data from 230 young technology firms using the partial least squares method (PLS) and cluster analysis.

Since the theoretical underpinnings and main empirical findings of RBV research have been summarized in a number of studies, including fairly recent ones (e.g., Newbert, 2007), we start with a brief discussion of research related to resource and capability configurations in organizations and introduce the conceptual framework that guides our study. Next, we describe our method and data and present the results of the empirical analyses. A concluding section discusses the implications of our findings for the RBV and for managerial practice.

THEORETICAL BACKGROUND

The idea of conceptualizing organizational activities as systems of interdependent elements has a relatively long tradition in organizational research and has found a variety of valuable applications in the strategy field (e.g., Sheehan and Foss, 2007; Porter and Siggelkow, 2008). Meyer, Tsui, and Hinings (1993: 1175) broadly defined configurations as 'any multidimensional constellation of conceptually distinct characteristics that commonly occur together.' Proponents of the approach have argued that a study of configurations leads to insights that would otherwise be unattainable or that would at least be out of the scope of research that focuses only on the effects of individual elements (Miller, 1981). For example, beyond offering a more holistic perspective to understanding organizational activities, configurational approaches facilitate insights into the equifinality of different configurations (Fiss, 2007).

Firms deploy resources and capabilities along the value chain to perform functional activities such as research and development (R&D), manufacturing, or sales and distribution. Following

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Fiss's (2007) recommendation to delineate an appropriate domain for the study of configurations, we focus our analysis on one particular functional activity that, for a number of reasons, provides a favorable setting for the present research: the firm's activity in sales and distribution (S&D). *Inter alia*, this functional activity includes the process of formulating, implementing, and controlling S&D plans, the creation and management of customer relationships, and the monitoring of the sales force and distribution channels (Day, 1994; Olson, Cravens, and Slater, 2001). Notably, prior research not only indicates that there is considerable variance in firms' ability to perform the S&D activity but also that this functional activity significantly influences firm performance. For example, Song *et al*. (2005) showed that customer-linking and market-sensing capabilities have a key influence on firm performance, results from Slater and Olson (2000) indicated a significant relationship between sales force management and firm performance, and Ethiraj *et al*. (2005) found that the development of client-specific capabilities through repeated interactions with clients positively affects project performance.

In order to understand the role of resources and capabilities in S&D, we must first identify those S&D resources and capabilities that are relevant in this functional area. Although extant research has revealed little about configurations of resources and capabilities (in S&D), there is a fairly large body of work that has investigated the role of *individual* resources and capabilities in S&D and that can serve as a guideline for identifying the relevant S&D resources and capabilities. While one might be tempted to include a long list of resources and capabilities in a conceptual model, prior studies have warned that such a procedure can result in spurious variables that impede the detection of configurational cluster structures in empirical data (Homburg, Jensen, and Krohmer, 2008). Therefore, we limit the number of resources and capabilities under consideration by focusing on a set of core constructs that are grounded in the literature to ensure their theoretical and empirical relevance. Following Amit and Schoemaker (1993) and Grant (1991),[1] we group S&D resources and capabilities into three categories: tangible resources, intangible resources, and capabilities (Figure 1).

It is worth reiterating that the present study seeks to advance knowledge of the resource-performance link by (a) investigating the effects of these different types of resources and capabilities on performance, and (b) exploring bundles or configurations of these resources and capabilities. In order to study these issues, we apply two analytical methods, which are discussed in the following section.

RESEARCH METHODOLOGY

Data and sample

Detailed data on the resources and capabilities used in S&D and on several other organizational characteristics are required in order to examine our research questions. No public dataset offers such information, so we conducted an online survey among 1,438 young technology firms based in Germany. Firms were randomly selected from the membership data of the Chamber for Industry and Commerce, in which membership is mandatory for all firms in Germany; therefore, using this data source does not impose any sort of bias. To match the requirements of our study, we included only R&D-intensive firms that were independently held and that were less than 12 years old (McDougall and Robinson, 1990).

We developed the survey instrument according to guidelines provided by Churchill (1979) and pretested it on 20 experts from business and academia. The invitation to complete the survey instrument was addressed to each firm's managing director or founder, who were considered the most reliable source of information for this study. Despite potential problems associated with data from a single respondent, such an approach is one of the few ways available to obtain data on intrafirm processes. After two reminders to nonresponders, the effective response rate was 16 percent (n=230), a rate that is comparable to that of other studies directed at top managers or business owners (Dennis, 2003). Responding firms had a median age of eight years and a median size of 20 to 49 employees and fell into the technology areas

[1] We use the term *resources* to denote 'stocks of available factors that are owned or controlled by the firm. [...] *Resources* consist ... of know-how that can be traded...., financial or physical assets..., human capital, etc.' (Amit and Schoemaker, 1993: 35) so they can be grouped into *tangible* and *intangible resources* (Grant, 1991). We use the term *capability* to refer 'to a firm's capacity to deploy *[r]esources*, usually in combination, using organizational processes' (Amit and Schoemaker, 1993: 35).

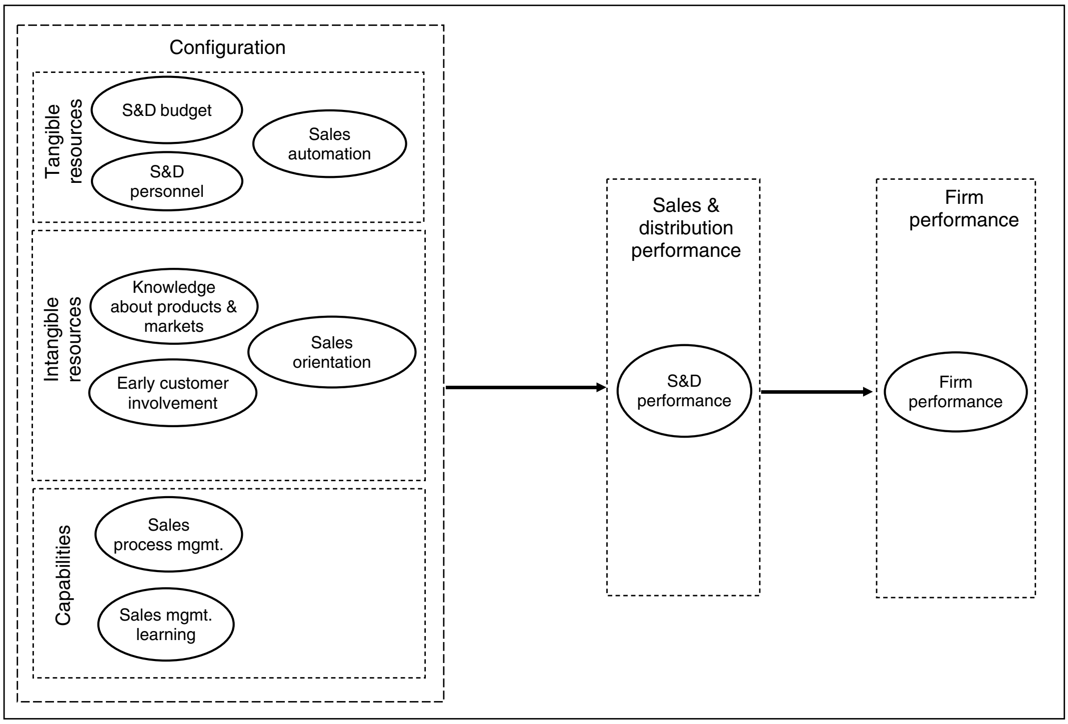

Figure 1. Theoretical framework

of information technology (IT), Internet, and software (48%); mechanical engineering (15%); electrical engineering (10%); medical/biotechnology (7%); automotive (5%); and other (15%).

To test for nonresponse bias, we compared the answers of early and late respondents (the first third vs. the last third of responders) by means of discriminant analysis (Armstrong and Overton, 1977). Significant differences were found in only four of the 74 indicators (two-tailed tests, $p<0.05$), suggesting that nonresponse bias should not be a concern.[2] We also tested for common method bias using Harman's one-factor test (Podsakoff and Organ, 1986), and the principal component factor analysis of the main variables showed that 21 factors with eigenvalues greater than 1 jointly accounted for 73 percent of the variance in the data. Therefore, common method bias did not appear to be a problem because more than one factor was identified, the first factor accounted for only 21 percent of the variance, and no general factor emerged in the unrotated factor structure.

[2] On the five percent level, one can expect 3.7 indicators to be significant.

Measures

Given our interest in measuring resources and capabilities in S&D, we conducted a comprehensive search for existing measures in the strategy, marketing, organizational, and innovation literatures (see Appendices A and B for all items, measured on seven-point Likert scales). An essential aspect of measurement specification is deciding whether to use reflective or formative indicator constructs (Bollen and Lennox, 1991), because this choice determines the suitable methods for subsequent data analysis and the appropriate criteria for reliability and validity testing (Diamantopoulos and Winklhofer, 2001). The main difference between the two construct types is the direction of causality between the indicators and the construct. In the case of reflective indicators, the direction of causality is from the construct to the indicators, whereas formative indicators 'cause' the latent variable (Jarvis, MacKenzie, and Podsakoff, 2003). In addition, for reflective constructs, indicators have to be interchangeable, there must be a strong correlation/covariation among indicators, and indicators must have the same antecedents and consequences (nomological net).

Independent variables: tangible resources, intangible resources, and capabilities

Tangible resources: We used multiple items to measure the constructs of sales automation (six items), sales personnel (seven items), and sales budget (three items). The measure for sales automation assessed the relative importance and usage of sales support technologies (e.g., telephone, e-mail/Internet), dedicated sales support software, and sales databases (Erffmeyer and Johnson, 2001). For the sales personnel construct, we adapted a measure from Brettel, Claas, and Heinemann (2006) to our S&D context. This measure comprises components such as staffing and training procedures, incentive schemes, and compensation structures. The sales budget construct assessed the financial resources available for sales activities relative to the competition (Borch, Huse, and Senneseth, 1999). Based on our criteria, a formative specification was used for the automation and personnel constructs and a reflective specification was used for the budget measure construct.
Intangible resources: Multiple items were used to measure market- and product-related knowledge (six items), sales orientation (seven items), and early customer involvement (five items). The items for the market- and product-related construct, taken from Piercy, Cravens, and Morgan (1999) and Rentz *et al*. (2002), encompass the sales personnel's knowledge of the firm's offering, competitors' products, and market trends. The sales orientation construct builds on items developed by Sumrall and Sebastianelli (1999), complemented with two items from Powell and Dent-Micallef (1997). The sales orientation construct covers the perceived importance of the sales function and of the sales personnel within the company and assesses the involvement of the top management in sales activities. Following Koufteros, Vonderembse, and Jayaram (2005) the early customer involvement construct captured the facets of customer integration. A reflective specification was used for all three constructs.
Capabilities: We also used multiple items to measure the sales management process (10 items) and learning activities (seven items). Based on Moncrief (1986) and Leigh and McGraw (1989), the sales management process construct captures the primary activities in the sales process, such as identifying and contacting customers, selling, and servicing. The learning activities construct, which is based on Lynn, Simpson, and Souder (1997), assesses the learning process of a firm with regard to specific activities in S&D. A formative specification was used for both constructs.

Dependent variables

S&D performance: We adopted seven of the 10 items suggested by McGrath *et al*. (1995) to develop our measure of S&D performance (cf. Appendix B).[3] These items capture S&D performance by assessing a firm's achievement level against goals set by this functional area.[4] Since we do not expect that different aspects of S&D performance will be correlated, we specified a formative construct (Jarvis *et al*., 2003).
Firm performance: The multidimensional firm performance construct captures four key performance dimensions. Drawing on Pelham (1999) we included two items each for each firm's financial performance and growth. For each item, we assessed the respondent's level of satisfaction with firm performance relative to the firm's competitors (cf. Appendix A) (Covin and Slevin, 1989). Following Jarvis *et al*. (2003) we specified a reflective construct. Several arguments support the use of perceptual performance measures. First, prior research has shown that respondents prefer perceptual performance measures because objective measures such as profits or revenues are seen as confidential. Because firms in our sample were privately held, they are under no obligation to reveal performance data. Second, using a multidimensional measure based on perceptual firm performance facilitates comparisons across firms and contexts, such as across industries, time horizons, and economic conditions (Song *et al*., 2005). Third, earlier studies have shown that perceptual

[3] Our understanding of 'performance' in S&D is similar to what McGrath *et al*. (1995) called 'competence.' While the items that capture objectives with regard to budget, staffing, major deadlines, user/client satisfaction, service, and the overall situation correspond to McGrath *et al*. (1995), the item that captures turnover objectives had to be adapted for use in our context.

[4] McGrath *et al*. (1995) pointed out several advantages of such a goal-centered operationalization, primary among which is that since the goal-centered approach is used only to derive the S&D performance measure, it minimizes potential problems of discriminant validity between, on the one hand, the S&D performance measure and, on the other, the firm performance and resource/capability constructs.

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performance measures tend to be highly correlated with objective indicators, which supports their validity (Dess and Robinson, 1984; Chandler and Hanks, 1993). We ensured the validity of this subjective performance measure by triangulating the information provided by our respondents with secondary objective performance data that was available for a subset of 37 firms of our sample. Using the AMADEUS database, we determined the average revenue growth rate over the last three years and correlated this objective information with the corresponding item reported by the managers, that is, the degree of satisfaction with the company's growth rate in comparison with the strongest competitors. Both measures show a strong correlation ($\rho = 0.31$, $p < 0.05$), supporting the validity of the subjective measure (Cohen, 1988).

Analytic methods

We address our research questions by employing PLS structural equation modeling and cluster analysis. The PLS method has recently gained popularity among management researchers because it offers a reasonably straightforward way of testing complex theoretical structures. We chose PLS as the most accepted variance-based structural equation modeling technique because it can accommodate models that combine formative and reflective constructs (Wold, 1985; Chin, 1998). Using both types of constructs in covariance-based structural equation modeling techniques such as LISREL or AMOS could lead to 'identification problems, the occurrence of implied covariances of zero among some measured variables, and the existence of equivalent models' (MacCallum and Browne, 1993: 540). Although these problems can be addressed, doing so may involve altering the original model in terms of its substantive meaning and/or parsimony.

In order to identify resource and capability configurations in S&D, we had to complement our PLS model with cluster analysis, following the clustering procedures outlined by Homburg *et al.* (2008). PLS shows the impact of single factors, but it does not indicate how a combination of factors influences the dependent variables. However, clustering provides an established technique for identifying groups with similar characteristics along the specified cluster variables, and has previously been employed for studying configurations in organizations (Fiss, 2007).

RESULTS

Following common practice in research that applies PLS, we provide an evaluation of our measurement model before presenting the results of the structural model. After establishing this general framework, we present the results of the cluster analysis and explore the performance outcomes associated with different resource and capability configurations.

PLS estimation: evaluation of measurement model

Following the procedures recommended by Chin (1998), we conducted an assessment of the reliability and validity of the measurement model. For the reflective constructs, we eliminated all indicators with a loading of less than 0.7 to ensure sufficient item reliability (Carmines and Zeller, 1979). The subsequent calculation of Cronbach's alpha, composite reliability, and average variance extracted (AVE) also indicated satisfactory reliability on the construct level (Appendix A), using conventional threshold criteria of 0.7 for Cronbach's alpha, 0.7 for composite reliability, and 0.5 for AVE. In line with Fornell and Larcker (1981), Table 1 suggests satisfactory discriminant validity for all five reflective constructs.[5] Moreover, all items share more variance with their respective constructs than with any other construct in the model, indicating discriminant validity on the item level (Appendix C).

The very nature of the measurement of formative constructs renders traditional assessments of convergent validity and individual item reliability irrelevant (Hulland, 1999). Therefore, we tested these constructs for multicolinearity by calculating variance inflation factors (VIFs) on the item level (Diamantopoulos and Winklhofer, 2001) and condition indices on the construct level (Belsley, Kuh, and Welsch, 1980). The VIF values for all indicators are well below the threshold criterion of 10, suggesting that there is no excessive multicolinearity present in the data. This finding is underscored

[5] To assess discriminant validity on the construct level, we follow Fornell and Larcker (1981) by calculating the square roots of the AVE values, which measure the average variance shared between a construct and its measures, and calculating the correlations between different constructs. Then we construct a matrix with the square root of the AVE values in the diagonal and the correlations between the constructs in the off-diagonal (Appendix C). We diagnose a sufficient level of construct discriminant validity because the values in the diagonal are greater than the values in the off-diagonal for the corresponding rows and columns.

Table 1. Correlations and discriminant validity on the construct level* (full sample)

Construct	1	2	3	4	5	6	7	8	9	10
1. Automation	n.a									
2. Personnel	0.203	n.a								
3. Budget	0.174	0.244	0.906							
4. Knowledge	0.128	0.447	0.218	0.762						
5. Sales orientation	0.062	0.298	0.191	0.352	0.748					
6. Customer involvement	−0.002	0.276	0.175	0.375	0.294	0.775				
7. Sales process	0.127	0.412	0.212	0.536	0.431	0.421	n.a			
8. Learning	0.096	0.475	0.272	0.517	0.375	0.397	0.690	n.a		
9. S&D performance	0.264	0.453	0.356	0.545	0.426	0.361	0.581	0.554	n.a	
10. Firm performance	0.131	0.320	0.330	0.438	0.286	0.315	0.388	0.391	0.653	0.825

* Table depicts square root of AVE on diagonal, and correlations on off-diagonal; n.a.: not applicable for formative constructs

Table 2. Path estimates, R^2, and Q^2 (full sample)

Path		Path coefficient
S&D performance → firm performance		0.634***
Automation → S&D performance		0.147**
Personnel → S&D performance		0.090
Budget → S&D performance		0.149***
Product-/market-knowledge → S&D performance		0.204**
Sales orientation → S&D performance		0.128*
Customer involvement → S&D performance		0.055
Sales process management → S&D performance		0.212**
Learning → S&D performance		0.135†
Learning → sales process management		0.691***
Construct	R^2	Q^2
Firm performance	0.402	0.522
S&D performance	0.516	0.400
Sales process management	0.477	0.308

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

by condition indices that range between 22 and 31, with the upper-bound threshold at 30 (Belsley *et al*., 1980; see Appendix B).

PLS estimation: structural model

Table 2 shows the results of the PLS estimation. We follow Chin (1998) in estimating the coefficient of determination R^2, the Stone-Geisser-Criterion Q^2 (Geisser, 1975), and the path coefficients with their respective t-values. The R^2 values for the three endogenous variables (0.426–0.516) indicate satisfactory explanatory power for our model, and the respective Q^2 values (0.308–0.522) suggest acceptable predictive relevance. Overall, the results presented in *Table* 2 indicate significant relationships between the identified resources and capabilities and S&D performance. We also find corroborating evidence of a significant effect of S&D performance on firm performance. Yet, because of an aggregation across potentially very different configurations of resources and capabilities and their performance effects, this overall model can provide insights only into the average effects of individual variables across all firms in the sample. Thus, as a next step, we explore the effects of resource and capability configurations.

Clustering procedure: identifying resource and capability configurations

To identify resource and capability configurations in S&D, we follow the three-step procedure

Table 3. Statistical cluster description

Resources and capabilities	Cluster	1 (n=31)	2 (n=55)	3 (n=53)	4 (n=67)
Tangible resources	Automation	-1.49^{c}	$0.27^{a,b}$	0.52^{a}	0.11^{b}
	Personnel	-0.25^{c}	0.78^{a}	0.17^{b}	-0.70^{d}
	Budget	-0.15^{b}	0.91^{a}	-0.53^{b}	-0.27^{b}
Intangible resources	Knowledge	0.11^{b}	0.54^{a}	$0.36^{a,b}$	-0.75^{c}
	Sales orientation	-0.02^{b}	0.61^{a}	$0.26^{a,b}$	-0.54^{c}
	Customer involvement	0.20^{a}	0.39^{a}	0.38^{a}	-0.63^{b}
Capabilities	Sales process management	0.03^{b}	0.64^{a}	0.43^{a}	-0.87^{b}
	Sales management learning	-0.31^{c}	0.86^{a}	0.13^{b}	-0.77^{d}
	S&D performance	-0.28^{b}	0.63^{a}	0.35^{a}	-0.56^{b}
	Firm performance	-0.02^{b}	0.49^{a}	$0.17^{a,b}$	-0.42^{c}

Reported values are mean values. In each row, cluster means with the same superscript are not significantly different ($p<0.05$) on the basis of Waller and Duncan's multiple-range test. The highest bracket is labeled with superscript 'a,' the next highest bracket with superscript 'b,' etc.
See Footnote 8 for an example of how to interpret the brackets.

outlined by Homburg *et al.* (2008). First, we determined the appropriate number of clusters using the hierarchical clustering algorithm developed by Ward (1963), complemented by the cubic clustering criterion proposed by Sarle (1983). This analysis provided strong support for a four-cluster solution.[6] Second, we assigned the cases in our sample to the appropriate cluster using the k-means clustering method. Third, we assessed the stability of this cluster assignment using McIntyre and Blashfield's (1980) cross-validation procedure. Results indicated a high level of stability.[7]

In order to develop a taxonomy of resource and capability configurations, we had to validate whether the identified clusters allowed for meaningful interpretations (Rich, 1992). Table 3 shows the cluster means for each of the eight resource/capability variables that had been used to identify the clusters and the two outcome variables (i.e., S&D performance and firm performance). To determine significant differences for these 10 continuous variables (cluster and outcome variables), we compared the means of the clusters using two different multiple comparison *post hoc* criteria: Waller and Duncan's (1969) multiple range test, and Tukey's honestly significant differences test (both at $p<0.05$). Based on these results, we assigned the clusters to brackets for each variable, expressed by the superscript labels in Table 3.[8] The cluster means for a given variable that carry the same superscript do not differ at the five percent level and, for all cluster means, both *post hoc* criteria led to the same bracket assignments.

Interpretation of the identified configurations

To highlight the empirically distinct characteristics of the configurations we identified, we assigned labels to each configuration. Even though these

[6] Since Ward's (1963) algorithm, as well as cluster analysis in general (Punj and Stewart, 1983), tends to be sensitive to outliers (Milligan and Hirtle, 2003), we eliminated 24 of our 230 cases as outliers, leaving 206 usable cases for the subsequent cluster analysis. Scaling, which Milligan and Hirtle (2003) identified as the second major source of problems in running Ward's (1963) algorithm, was not relevant in this case. The construct values of the resource and capability dimensions estimated in PLS that we used as input for the cluster analysis were already standardized.

[7] Using the cross-validation procedure, we randomly split the 206 usable cases into two halves and applied the k-means clustering method to each half (cf. Homburg *et al.*, 2008). We assigned each case in the second half to the cluster with the nearest cluster centroid from the first half (based on the lowest squared Euclidean distance). Comparing the two cluster assignments for each observation in the second half—applying the k-means clustering method and manually assigning observations based on the nearest cluster centroid—we found that almost 90 percent coincided.

[8] Examples for interpreting Tables 3 and 4:

a) For the tangible resource *sales personnel*, each cluster falls into a separate bracket so the superscripts range from *a* to *d*, with Cluster 2 in the highest bracket and Cluster 4 in the lowest. Accordingly, in Table 4, which translates the superscripts into verbal bracket names, the labels are *high, moderately high, moderately low,* and *low*.
b) For the capability *sales process management*, our analysis results in only two brackets of significantly different cluster means. Clusters 2 and 3 are positioned in the *high* bracket, whereas Clusters 1 and 4 fall into the *low* category of this variable.

Table 4. Verbal cluster description

Cluster **Resources and capabilities**	1 *S&D moderates*	2 *S&D all stars*	3 *Efficiency centrics*	4 *S&D neglects*
Automation	Low	Medium, high	High	Medium
Personnel	Moderately-low	High	Moderately-high	Low
Budget	Low	High	Low	Low
Knowledge	Medium	High	Medium, high	Low
Sales orientation	Medium	High	Medium, high	Low
Customer involvement	High	High	High	Low
Sales process management	Low	High	High	Low
Sales management learning	Moderately-low	High	Moderately-high	Low
S&D performance	Low	High	High	Low
Firm performance	Medium	High	Medium, high	Low

With two brackets: High, low.
With three brackets: High, medium, low.
With four brackets: High, moderately-high, moderately-low, low.
Note that clusters may be in two brackets when cluster means are not significantly different.

labels may oversimplify the actual solutions, the resulting taxonomy makes the configurations more easily accessible and facilitates discussion of our findings.

Configuration 1: 'S&D moderates.' Firms using this configuration appear to neglect the often more visible tangible resources (automation, personnel, and budget) while focusing on the intangible ones where they are positioned in the medium or high bracket (see Table 4). Furthermore, firms with this configuration rank in the low bracket in terms of their sales process management capability. This finding contrasts with that of our full model, where this capability has the strongest single effect on S&D performance (Table 2). Overall, this configuration leads to low levels of S&D performance; however, in spite of the strong link between S&D and firm performance in the full model, this configuration still ranks in the medium bracket in terms of its effect on firm performance.[9]

Configuration 2: 'S&D all stars.' Firms that employ this configuration hold a strong position across the whole range of resources and capabilities that we identified as relevant in S&D. None of the other clusters beats the 'all star' firms significantly on any of the employed resources and capabilities. Accordingly, this configurational solution ranks highest in terms of S&D performance and firm performance and shares the position of top performer with Configuration 3.

Configuration 3: 'Efficiency-centrics.' Firms that employ this configuration focus on efficiency-enhancing resources and capabilities, since they show a strong position in terms of sales automation, sales process management, and product/market knowledge and rank low in terms of sales budget. This type of configuration performs remarkably well: despite showing a lower cluster mean value in terms of S&D performance and firm performance than the 'all stars,' it ranks in the same bracket as Configuration 2 for both dimensions because the mean differences of the associated variables are insignificant.

Configuration 4: 'S&D neglects.' With the exception of sales automation, the fourth configuration ranks in the lowest brackets for all cluster variables. This configuration clearly underperforms the other three configurations.

Exploring equifinality in S&D performance and firm performance

The cluster analysis suggested that two configurations, the 'S&D all stars' and the 'efficiency-centrics,' lead to equifinal outcomes in terms of S&D performance and firm performance. Specifically, Table 4 indicates that both configurations rank relatively high on a number of resources and capabilities; only the sales budget, where the 'efficiency-centrics' rank in the lowest bracket,

[9] We estimated a separate PLS model for firms in this cluster in order to develop a better understanding of this particular S&D performance-firm performance relationship. Results show that this link is significantly weaker than in the overall sample; hence, it is not surprising that low S&D performance does not have as strong an effect on firm performance outcomes as do the other clusters and the full sample.

diverges. From an economic point of view, this pattern is not necessarily surprising, as equifinality in terms of goals attained in S&D can be found in firms that spend less on S&D (which may indicate lower goals) as well as in firms that spend more on S&D.

One could argue that it is not the configuration itself, but the effect of an individual variable that leads to the equifinal outcomes we observed. To test this explanation, we estimated two separate PLS models for each of the two configurations (results are available from the authors). However, the analysis does not show any significant differences in path coefficients between these configurations ($p<0.10$), that is, in both groups resources and capabilities have highly similar direct effects on performance. This finding suggests that the equivalent outcomes stem from how the resources and capabilities are bundled.

Robustness tests

We examined the robustness of our results for different firm characteristics by estimating structural models for several subsamples. For example, we divided our sample in terms of firm size (less than 20 employees vs. more than 20), age (new vs. established firms), and industry (IT/software vs. non-IT/software). These analyses produced only minimal differences in the path coefficients for the various submodels (results are available from the authors). Only the link between S&D performance and firm performance appears to be stronger in IT/software firms than in firms in other industries.

Because there is no well-established method with which to identify causal relationships in a PLS setting, we reran our analysis with performance data from a later period (t+2). Specifically, 18 to 24 months after our initial data collection effort, we contacted the original respondents to obtain an update for the firm performance measure and received responses from 127 of the original respondents (55.2% response rate). For these firms, we ran two separate path analyses using the firm performance data from the first (t0) and second data collections (t+2). That the direction and magnitude of the relationships between (a) resources/capabilities and S&D performance, and (b) S&D performance and firm performance were robust suggests that the hypothesized causal relationships exist and that they remain stable over time. For the one significantly different path coefficient we found, there was a difference only in the magnitude, not in the direction of this link.

DISCUSSION

Using data obtained from 230 technology ventures, the present study sought to improve our understanding of the resource-performance link by investigating two main issues. First, based on a careful measurement of resources and capabilities in the S&D function, we analyzed how these resources and capabilities contribute to performance in that area. Second, we identified distinct configurations of resources and capabilities in S&D in order to determine how these configurations influence the dependent variables. Our analysis identified four empirical archetypes of resource and capability configurations, two of which lead to superior performance outcomes. We believe that our findings provide a number of interesting insights for strategy research and that they have important normative implications.

First, by making resources and capabilities in a clearly specified functional area the subject of a careful empirical assessment, we examined relationships among constructs that have often been asserted, but seldom tested, across a relatively large sample of firms. Our detailed analysis not only clarifies the potential contribution of different types of resources and capabilities to performance outcomes, but also allows tracing a clearer trail of logic from the resources and capabilities deployed in a particular functional area to performance outcomes in that area, and to the overall performance of the firm.

Second, we added another level of complexity to our study by exploring the role of resource and capability configurations. In doing so, this study is one of the few empirical contributions to emphasize that resources and capabilities need to be deployed together to create value for the firm (Priem and Butler, 2001). Our results show that four configurations of resources and capabilities emerge from the eight cluster variables, suggesting that there are only a few internally consistent configurations. Furthermore, these archetypical configurations reveal significant variations among the solutions firms deploy, giving these cases their distinct character. We find that firms tend to have resources and capabilities that are generally relatively poor (Cluster 4), generally relatively good (Clusters 2 and 3), or generally mediocre (Cluster 1). In other words, firms with relatively poor resources tend to have most of their resources in the 'poor' category and the reverse holds for firms with relatively good resources. Although additional research is needed to understand why this pattern exists, the abilities of the firm's agent in charge of developing and deploying resources and capabilities may explain a good part of this phenomenon (cf. Mahoney, 1995; Sanchez, 2004).

Third, our analysis adds to the RBV literature by providing exploratory evidence on the performance outcomes associated with different resource and capability configurations. Specifically, our analysis of the four configuration archetypes indicates that two configurations lead to low or low-medium performance outcomes (Clusters 1 and 4), a finding that is not particularly surprising since the RBV would predict that firms with generally low or low-medium levels of resources will achieve these relatively low performance levels. Similarly, we would expect that firms with generally high levels of resources would achieve high performance outcomes, and we find evidence supporting this assumption with Cluster 2.

A much less obvious picture emerges with Cluster 3, because firms in this cluster deploy a set of resources and capabilities that seems to be inferior to Cluster 2, yet achieve equifinal performance outcomes (Meyer *et al*., 1993; Fiss, 2007). Since firms in Cluster 3, the 'efficiency-centrics,' expend fewer financial resources on the S&D function, it is possible that less good, less costly resources could produce outcomes in terms of the firm's goals that are equivalent to those of firms that have better and more costly resources. These findings also suggest that configurations that lead to relatively higher outcomes in terms of the firm's goals are not necessarily the inverse of those that lead to lower performance.

Our results also have several normative implications. Since our analysis focuses on elements that managers can shape through their actions, such as the orchestrated deployment of resources and capabilities, the findings presented in this study can offer detailed insights on the link between the management of resources and the creation of value. In particular, our findings provide insights into the critical question of which resource deployment strategies *ex ante* are likely to be effective. Among the four configurations identified in this study, only two solutions are associated with superior outcomes.

By identifying the different configurations of resources and capabilities deployed in firms, our study also helps managers in their efforts to think through alternative configurations when restructuring their S&D activities, and can assist entrepreneurs in setting up the S&D function in new firms. While managers should not underestimate the challenging nature of configuration development, they should also see that this complexity is of some value because competing firms will not be able to replicate the underlying configurations overnight; replication takes time because the entire configuration solution, rather than individual resources or capabilities, must be imitated. Moreover, if managers know about equifinal configuration solutions, they could use that knowledge to design a superior, flexible configuration that is more robust to environmental change (cf. Fiss, 2007).

This study explored a topic that has received little attention thus far. In interpreting its results, one must keep certain limitations in mind. Perhaps most important among them is that the performance measures utilized in this research are perceptual. Although our robustness tests indicated a strong correlation between subjective and objective performance measures for the subsample of 37 firms for which objective data was available, we cannot rule out that the observed performance differences could be a function of different firm goals rather than of differences in objective firm performance. As a consequence, caution should be taken when interpreting the performance results. The study was also limited by our goal of providing a detailed empirical assessment of resources and capabilities. Given the fairly comprehensive data collection efforts that a study of resources and capabilities in one functional area requires, we did not observe resources and capabilities in other functional areas or the interrelationships of the S&D function with other functions. Finally, this study uses data obtained from technology ventures located in Germany. Whereas a sample of German firms may address a geographical area that is infrequently encountered in empirical strategy research, generalizability may be limited.

We hope that the results of this study will encourage other researchers to enrich our knowledge on how resources and capabilities influence

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firm performance, thereby adding to our understanding of the sources of competitive advantage. For instance, an investigation of why firms with poor (good) resources tend to have configurations in which most of their resources are poor (good) would be valuable. The methodological approach pursued in this study—a detailed empirical measurement of resources and capabilities, combined with a set of analytical methods—appears to be a fruitful approach to such research.

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APPENDIX A: DETAILED INFORMATION ON REFLECTIVE CONSTRUCTS (FULL SAMPLE)

The possible range for all measures was from 1 to 7 ('totally disagree' to 'totally agree').
All threshold criteria were also met in the respective subsamples.

Construct 'sales budget'

Cronbach's alpha	0.794
Composite reliability	0.906
AVE	0.829

Item text	*Mean*	*S*.D	*Range*	*Item loading*
1) In comparison to our competitors, our sales department has substantial financial resources available.	4.083	1.540	1–7	0.926
2) In comparison to other functions in our company (e.g., operations, R&D), our sales department has substantial financial resources available.	4.291	1.495	1-7	0.895
3) Even with a significantly higher sales budget, we would not be able to achieve substantial increases in terms of our sales.	3.983	2.006	1-7	elim.

Construct 'market- and product-related knowledge'

Cronbach's alpha	0.826
Composite reliability	0.877
AVE	0.588

Item text	*Mean*	*S*.D	*Range*	*Item loading*
Our salespeople. . .				
1) . . .have extensive knowledge of the design and specification of company products/services.	5.839	1.147	1-7	elim.
2) . . .have extensive knowledge of the application and functions of company products/services.	5.922	1.071	1-7	0.739
3) . . .keep abreast of our company's production and technological developments.	5.709	1.147	2-7	0.720
4) . . .have extensive knowledge of our customers' markets and products.	5.517	1.143	1-7	0.735
5) . . .have extensive knowledge of our competitors' products, services, and sales policies.	4.622	1.361	1-7	0.828
6) . . .have extensive knowledge of our target markets.	5.474	1.270	2-7	0.808

Construct 'sales orientation'

Cronbach's alpha	0.754
Composite reliability	0.834
AVE	0.565

Item text	*Mean*	*S*.D	*Range*	*Item loading*
1) In our company, sales is widely recognized as a very important function.	6.330	1.034	2-7	Elim.
2) Salespeople are widely recognized as a very important part of our company.	6.104	1.159	1-7	Elim.
3) In our company, salespeople are highly regarded.	5.487	1.253	1-7	0.752

Construct 'sales orientation' (*Continued*)

Item text	*Mean*	*S*.D	*Range*	*Item loading*
4) Our founders/managing directors are personally committed to the development of our sales program.	6.452	1.084	1-7	0.712
5) Our founders/managing directors clearly communicate their commitment to the sales program.	6.570	0.994	1-7	0.771
6) Our founders/managing directors champion our sales department within the company.	6.222	1.163	1-7	0.770
7) In our company, sales successes are actively celebrated.	4.674	1.739	1-7	elim.

Construct 'early customer involvement'

Cronbach's alpha	0.839
Composite reliability	0.884
AVE	0.604

Item text	*Mean*	*S*.D	*Range*	*Item loading*
Starting in a very early development stage, ...				
1) ...we have listened to our (potential) customers in developing the product concept.	6.035	1.101	2-7	0.744
2) ...we have visited our (potential) customers to discuss product development issues.	5.696	1.339	1-7	0.771
3) ...we have studied how our (potential) customers might use our products.	5.730	1.307	1-7	0.862
4) ...our salespeople have met with (potential) customers.	5.630	1.414	1-7	0.784
5) ...we have involved our (potential) customers in the product development process more than is usual in our industry.	5.309	1.419	1-7	0.715

Construct 'firm performance'

Cronbach's alpha	0.879
Composite reliability	0.917
AVE	0.735

Item text	*Mean*	*S*.D	*Range*	*Item loading*
We are very satisfied with...				
1) ...the development of our business in comparison with other firms in our industry.	5.248	1.352	1-7	0.909
2) ...our growth rate in comparison with our strongest competitors.	5.096	1.445	1-7	0.850
3) ...the forecast for our operating profit for upcoming years.	4.948	1.369	1-7	0.824
4) ...our product success in comparison to our strongest competitor.	5.291	1.232	1-7	0.843

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APPENDIX B: DETAILED INFORMATION ON FORMATIVE CONSTRUCTS (FULL SAMPLE)

The possible range for all measures was from 1 to 7 ('totally disagree' to 'totally agree').
All threshold criteria were also met in the respective sub samples

Construct 'sales automation'					
Condition index 25.157					
Item text	*Mean*	*S.D.*	*Range*	*Item weight/ significance*	*VIF*
What is the relevance of the following technologies in your sales effort?					
1) Telephone	6.465	1.064	1-7	−0.064	1.222
2) Fax	3.526	1.809	1-7	0.058	1.196
3) Email/Internet	6.430	1.083	1-7	0.060	1.224
4) PC/laptop	6.226	1.282	1-7	0.387	1.406
5) Specialized sales software or tools (e.g. Excel-based, SFD, CAS etc.)	5.404	1.536	1-7	1.017***	1.544
6) Specialized databases (e.g. Access-based, external online databases, on CD Rom, etc.)	5.287	1.642	1-7	−0.548*	1.625

Construct 'sales personnel'					
Condition index 28.151					
Item text	*Mean*	*S.D.*	*Range*	*Item weight/ significance*	*VIF*
1) In the recruiting process, we check whether a candidate for the sales department has substantial knowledge of our market.	5.817	1.251	1-7	0.084	1.673
2) In the recruiting process, we check whether a candidate for the sales department has sufficient technical and product-related knowledge.	5.491	1.347	1-7	0.127	1.696
3) In the recruiting process, we check whether a candidate for the sales department has substantial sales experience.	5.752	1.176	2-7	−0.340**	1.244
4) Our new salespeople usually receive detailed information on customers and competitors.	6.183	1.201	1-7	0.177	1.371
5) Our salespeople receive regular updates on market trends.	4.939	1.609	1-7	0.881***	1.397
6) The performance review of our salespeople is based partially on market-related factors (e.g., dealing with customers, market knowledge, etc.).	6.122	0.945	2-7	−0.029	1.434
7) The compensation of our salespeople is partially based on market-related figures (e.g., # customers, revenue, margin, etc.).	5.304	1.939	1-7	0.262*	1.056

Construct 'sales process management'					
Condition index 31.197					
Item text	*Mean*	*S.D.*	*Range*	*Item weight/ significance*	*VIF*
Please evaluate the importance of the following activities for salespeople in your company:					
1) Identifying potential new customers	5.330	1.238	2-7	0.025	1.892
2) Gathering information on customer needs and objectives	5.335	1.310	1-7	0.387***	2.743
3) Calling potential customers	5.609	1.289	2-7	0.146	1.850
4) Determining who are key decision makers with the customer	5.696	1.157	1-7	0.198†	2.442
5) Spending time with potential customers (e.g., evening meal or drink)	4.700	1.567	1-7	0.059	1.504
6) Developing personal rapport with the buyer	5.743	1.186	2-7	0.035	1.646
7) Creating favorable impression of our company	6.404	0.786	3-7	0.132†	1.532
8) Presenting the sales message	5.804	1.149	1-7	0.094	1.780
9) Closing the sale	5.704	1.160	2-7	0.004	1.873
10) Receiving feedback from customers after the actual sale	5.439	1.458	1-7	0.291**	1.832

Construct 'sales management learning'					
Condition index 22.841					
Item text	*Mean*	*S.D.*	*Range*	*Item weight/ significance*	*VIF*
1) We proficiently record reactions from customers and/or sales partners when contacting them.	4.604	1.615	1-7	0.283*	4.167
2) We proficiently review reactions from customers and/or sales partners when contacting them.	4.800	1.525	1-7	0.306*	3.679
3) A history of past sales activities is readily available.	5.170	1.657	1-7	0.073	1.770
4) We proficiently review the process of contacting customers.	4.530	1.636	1-7	−0.005	2.962
5) We frequently conduct review meetings after contacting a customer.	4.378	1.648	1-7	0.018	2.833
6) Review meetings after contacting a customer often lead to incisive discussions.	4.378	1.613	1-7	0.295*	2.769
7) Reactions of customers and/or sales partners and subsequent discussions influence our approach to contacting customers in the future.	5.022	1.568	1-7	0.252*	2.172

Construct 'sales & distribution performance'					
Condition index	26.148				
Item text	*Mean*	*S.D.*	*Range*	*Item weight/ significance*	*VIF*
Our sales department met. . .					
1) . . .all budget objectives.	5.235	1.491	1-7	0.202*	1.789
2) . . .all staffing objectives.	5.065	1.487	1-7	0.184*	1.472
3) . . .all major deadlines.	5.330	1.412	1-7	0.163*	2.170
4) . . .all turnover objectives.	5.074	1.656	1-7	0.292**	2.543
5) . . .all user/client satisfaction objectives.	5.587	1.257	1-7	0.298***	2.507
6) . . .all service objectives.	5.509	1.221	1-7	0.063	2.640
7) . . .objectives overall.	5.065	1.328	1-7	0.132	2.821

Appendix C: Discriminant Validity on the Item Level

Constructs *Items*	Automation	Personnel	Budget	Knowledge	Sales orientation	Customer involvement	Sales process	Learning	S&D performance	Firm performance
Budget 1	0.130	0.209	**0.925**	0.238	0.149	0.169	0.198	0.260	0.348	0.353
Budget 2	0.193	0.240	**0.895**	0.152	0.204	0.150	0.188	0.235	0.296	0.240
Knowledge 2	−0.009	0.288	0.008	**0.738**	0.316	0.291	0.361	0.347	0.315	0.244
Knowledge 3	0.130	0.334	0.165	**0.718**	0.310	0.377	0.396	0.393	0.390	0.338
Knowledge 4	0.047	0.343	0.132	**0.736**	0.214	0.231	0.384	0.400	0.375	0.326
Knowledge 5	0.113	0.359	0.206	**0.827**	0.284	0.296	0.409	0.396	0.467	0.349
Knowledge 6	0.169	0.377	0.262	**0.808**	0.244	0.257	0.487	0.438	0.502	0.396
Sales orientation 3	0.008	0.313	0.227	0.369	**0.750**	0.249	0.402	0.391	0.425	0.284
Sales orientation 4	0.077	0.137	0.149	0.259	**0.715**	0.167	0.234	0.170	0.269	0.208
Sales orientation 5	0.076	0.196	0.085	0.172	**0.773**	0.197	0.306	0.247	0.264	0.199
Sales orientation 6	0.051	0.195	0.062	0.192	**0.769**	0.256	0.305	0.255	0.259	0.125
Customer involvement 1	−0.090	0.197	0.113	0.257	0.240	**0.744**	0.258	0.341	0.243	0.273
Customer involvement 2	−0.039	0.130	0.060	0.216	0.212	**0.773**	0.268	0.172	0.147	0.147
Customer involvement 3	0.031	0.319	0.175	0.378	0.246	**0.862**	0.445	0.438	0.385	0.273
Customer involvement 4	0.011	0.112	0.099	0.238	0.256	**0.784**	0.293	0.216	0.264	0.174
Customer involvement 5	0.039	0.236	0.187	0.307	0.186	**0.715**	0.300	0.272	0.267	0.312
Firm performance 1	0.122	0.219	0.276	0.371	0.211	0.246	0.306	0.270	0.560	**0.879**
Firm performance 2	0.058	0.173	0.260	0.311	0.198	0.230	0.233	0.235	0.508	**0.830**
Firm performance 3	0.180	0.290	0.264	0.358	0.287	0.247	0.321	0.348	0.565	**0.805**
Firm performance 4	0.036	0.272	0.298	0.370	0.222	0.338	0.371	0.381	0.531	**0.856**
Firm performance 5	0.140	0.366	0.270	0.402	0.264	0.243	0.376	0.386	0.535	**0.773**

* Table depicts correlations of reflective indicators with all constructs used in the model. Correlations of indicators with their respective construct are highlighted.