The Role of Organizational Capabilities in Achieving Superior Sustainability Performance

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Abstract

Executives and scholars alike strongly emphasize the increasing need to adequately respond to the economic needs of customers while simultaneously considering human welfare and ecological constraints. This study contributes to the ongoing debate on the triple bottom line by disclosing a compilation of organizational capabilities (strategic flexibility, value chain flexibility, and customer integration) that supports firms in achieving superior sustainability performance. Using survey data of chemical firms in Germany, structural equation modeling eventually confirms the mediating role of value chain flexibility and customer integration in the strategic flexibility–sustainability performance relationship.

Keywords: Strategic Flexibility, Value Chain Flexibility, Customer Integration, Sustainability Performance, Consistent PLS, Structural Equation Modeling.

1. Introduction

The management literature debates actively how companies can reconcile economic, social, and environmental performance (e.g., Kolk & Pinske, 2005; Nidumolu, Prahalad, & Rangaswami, 2009; Wagner, 2015). While prior research shows that being environmentally and socially sustainable is profitable (Auger, Burke, Devinney, & Louviere, 2003; Barnett & Salomon, 2012; Clemens, 2006; Hart & Ahuja, 1996; Stefan & Paul, 2008), the literature does not reveal what organizational capabilities support firms in exploiting various opportunities that emerge from environmental and societal needs. The understanding of the link between organizational capabilities and sustainability performance, that is, meeting the needs of organizational stakeholders while simultaneously considering human welfare and ecological constraints (Chow & Chen, 2012; Nidumolu et al., 2009), remains rudimentary and underdeveloped. To close this research gap, this study builds on the dynamic resource-based view of the firm (Eisenhardt & Martin, 2000; Teece, Pisano, & Shuen, 1997) and discloses how different organizational capabilities at the strategic and operational level, namely strategic flexibility, value chain flexibility, and customer integration, lead to sustainability performance.

Constraints that emerge from the environment and society create discontinuities and dynamics that threaten firms' existing resources and capabilities and, thereby, their current sources of competitiveness (Aragon-Correa & Sharma, 2003; Hart, 1995; Hart & Dowell, 2011). The need to adapt within ambiguous markets and to renew existing sources of competitiveness challenges firms to "integrate, build, and reconfigure internal and external competences" (Teece et al., 1997, p. 516). One of these dynamic capabilities refers to the firm's ability to create flexibility in controlling and exploiting resources in the pursuit of alternative strategic actions (Zhou & Wu, 2010). Companies that are able to flexibly allocate their resources to alternative courses of action are in a better position to deal with environmental changes, design more sustainable offerings (e.g., products that consist of renewable inputs), invest in manufacturing technologies that demand less energy or avoid toxic by-products, or reverse unproductive resource deployment (Bock, Opsahl, George, & Gann, 2012; Hart & Milstein, 2003; Sanchez, 1995; Zhou & Wu, 2010). Flexibility in resource allocation therefore can explain why some companies initiate organizational change faster than their rivals (Eisenhardt & Martin, 2000; Nadkarni & Narayanan, 2007; Simon, Hitt, & Ireland, 2007).

Nevertheless, although strategic flexibility is indispensable to respond to environmental changes, flexibility in resource allocation by itself might be insufficient to achieve superior sustainability performance without adequately adapting structures and processes at the operational level (Angell & Klassen, 1999; Hart & Milestein, 2003; Klassen & Angell, 1998; Milgrom & Roberts, 1990; Nidumolu et al., 2009). In accordance with the dynamic resource-based view of the firm, strategic flexibility might not directly affect the output of the firm but only indirectly through an impact on operational capabilities (Helfat & Peteraf, 2003). This study considers value chain flexibility and customer integration as two important, successively linked operational capabilities that mediate the strategic flexibility-sustainability performance relationship. While value chain flexibility refers to a firm’s ability to coordinate and execute its operational activities along the internal value chain (Helfat & Peteraf, 2003; Teece et al., 1997; Zhang, Vonderembse, & Lim, 2002), customer integration ensures the subsequent integration of external information into operational activities (e.g., Berns et al., 2009). By providing access to complementary know-how, such as usage-related product knowledge, and facilitating the firm’s understanding of unanticipated changes in environmental and social requirements, the involvement of customers reduces uncertainties in eco-product design (Wong, 2013), accelerates time to market (e.g., Fang, 2008; Reay & Seddighi, 2012), enhances market success (e.g., Koufteros, Rawski, & Rupak, 2010), and, hence, precedes superior sustainability performance.

Using variance-based structural equation modeling (SEM) and fuzzy-set qualitative comparative analysis (fsQCA), this study empirically confirms the mediating role of value chain flexibility and customer integration in the strategic flexibility-sustainability performance relationship. Hence, firms have to remain flexible at both the strategic and operational level in order to adequately cope with environmental and social constraints. Once firms are able to flexibly allocate and apply their resources, they can benefit from the exploitation of their customers' complementary know-how in the pursuit of superior sustainability performance. Apart from contributing to the ongoing debate on the triple bottom line within the business research literature, this study contributes to the ongoing research on SEM by specifying the corresponding measurement model as both common factor model and composite model. Instead of specifying the measurement model a priori to the analysis, this study analyzes whether the specification of the measurement model as common factor model or composite model might lead to varying conclusions. While conventional PLS functions as algorithm for estimating the composite model, this study applies consistent PLS (PLSc) as extension to conventional PLS and further estimates the proposed research model as common factor model.

2. Theory and Hypotheses

At the heart of the dynamic resource-based theory is the question of how companies develop and change their organizational capabilities to achieve competitive advantage over a period of time (e.g., Helfat, 2000; Helfat & Raubitschek, 2000; Teece et al., 1997). To answer this question, scholars distinguish between two types of organizational capabilities: dynamic capabilities and operational capabilities (also known as ordinary capabilities) (e.g., Cepeda & Vera, 2007; Helfat & Winter, 2011). Dynamic capabilities, denoting "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997, p. 516), do not directly contribute to the output of the firm but do so indirectly through an impact on operational capabilities. The latter refer to routines (or collection of routines) that allow firms to perform an activity on a repeated and reliable basis (e.g., Easterby-Smith, Lyles, & Peteraf, 2009; Helfat & Winter, 2011; Zollo & Winter, 2002; Zott, 2003). Thus, while dynamic capabilities initiate change through strategically transforming the firm's business by reconfiguring its resource base (Helfat, Finkelstein, Mitchell, Peteraf, Singh, Teece, & Winter, 2007), operational capabilities ensure the efficient and effective execution and coordination of the variety of operational tasks in order to achieve business output on a daily base (Helfat & Peteraf, 2003). In other words, operational capabilities mediate the relationship between dynamic capabilities and the output of the firm.

Considering the conceptual distinctiveness of dynamic and operational capabilities embedded in the dynamic resource-based theory, this study proposes that a dynamic capability, namely strategic flexibility, indirectly contributes to sustainability performance through an impact on a series of operational capabilities, namely value chain flexibility and customer integration. Figure 1 depicts the proposed research model.

Figure 1 here.

2.1 Strategic Flexibility and Value Chain Flexibility

Constraints from the environment and society create discontinuities and dynamics that threaten firms' existing resources and capabilities and, thereby, their current sources of competitiveness (Aragon-Correa & Sharma, 2003; Hart & Dowell, 2011). As business environments are more competitive and dynamic than ever before, the ability of a company to rapidly reallocate resources to new courses of action will ultimately determine whether a company can create competitive advantage faster than its rivals (Shimizu & Hitt, 2004; Nadkarni & Narayanan, 2007). The literature refers to this dynamic capability as strategic flexibility and defines it as the "ability of a firm to reallocate and reconfigure its organizational resources, processes, and strategies to deal with environmental changes" (Zhou & Wu, 2010, p. 549). Hence, strategic flexibility enables firms to modify their resource base by reallocating resources to the adjustment of existing value chains (e.g., committing resources to make production processes more sustainable) or the creation and design of new value chains (e.g., committing resources to develop, manufacture, and deliver a new sustainable product). When strategic flexibility is high, firms are in a better position to coordinate the flexible use of resources and, by this means, to realign operational routines to the context of an adapted or new value chain (e.g., Teece, 2007). Strategic flexibility functions as an organizing principle for restructuring and coordinating the alignment of operational routines within and across different value chains. By ensuring the flexible redeployment of resources (e.g., production- and marketing-related resources) along and across various internal value chains as well as integrating and altering value chain specific operational routines, strategic flexibility enhances a firm's ability to operate flexible within a specific value chain. This operational capability refers to value chain flexibility and defines the ability of a firm to coordinate and execute operational routines along a specific value chain, including product development, manufacturing, and logistics (Zhang et al., 2002). Value chain flexibility comprises activities to share information on customer requirements internally and externally, to compensate for fluctuations in raw material supply, as well as operating routines to maintain flexible production programs (Coltman & Devinney, 2013; Narasimhan, Swink, & Wook Kim, 2005; Patel, 2011).

Through enabling the flexible allocation of resources, strategic flexibility eventually supports the development of new skills and routines that allows a firm to execute flexible manufacturing programs and to timely share information across the value chain. By further supporting the manufacturing of a broad range of product variations and the marketing of a diverse product portfolio, strategic flexibility prepares firms to properly respond to a variety of unanticipated and idiosyncratic customer expectations (e.g., Kortmann, Gelhard, Zimmermann, & Piller, 2014). Accordingly, strategic flexibility precedes value chain flexibility, which concurs with prior literature that similarly emphasizes the impact of strategic flexibility on the creation, integration, and reconfiguration of operational capabilities (Helfat & Peteraf, 2003; Kortmann et al., 2014).

Hypothesis 1: Strategic flexibility positively relates to value chain flexibility.

2.2 Value Chain Flexibility and Customer Integration

Prior literature stresses that firms have to become adaptive and flexible throughout their operational activities in order to effectively and efficiently implement changes that allow the successful pursuit of alternative strategic options (Kolk & Pinske, 2005; Nidumolu et al., 2009; Zhang et al., 2002; Zhang, Vonderembse, & Lim, 2003). When firms pursue an alternative strategic option, they typically have to deal with changing customer demands (Worren, Moore, & Cardona, 2002). However, as Zhang et al. (2003, p. 175) observe, "the breadth and intensity of flexibility needed to cope with [these] changing customer requirements cannot be provided by one department or function" alone. By synchronizing operational activities throughout the entire value chain and, thereby, providing operational flexibility, value chain flexibility eliminates bottlenecks and increases the firm's responsiveness to changing customer demands (Zhang et al., 2002; Zhang et al., 2003).

These underling boundary spanning activities of value chain flexibility illustrate that operational capabilities in general might not function in isolation from other operational capabilities, but can also affect each other (Coltman & Devinney, 2013; Tu, Vonderembse, & Ragu-Nathan, 2001). Value chain flexibility gears to the operational functioning of a company as it entails processes to respond to customer demands on a reliable and repeatable base and, thereby, fosters the integration of customers into a firm's operational activities (Hillebrand & Biemans, 2004; Zhao, Huo, Selen, & Yeung, 2011). When firms align operational activities throughout various functional departments, intensively share information and communicate both standardized (e.g., information on the general function and usability of a product or service) and customized information (e.g., information on certain product specifications, delivery options, or order volumes) internally, they are able to more effectively evaluate, assimilate, and apply external information (Cohen & Levinthal, 1990; Sherman, Berkowitz, & Souder, 2005; Zahra & George, 2002; Zhang et al. 2003; Zhao et al., 2011). The resulting improved understanding of customers eventually support firms in integrating customers into their operational activities (Zhao et al., 2011). Furthermore, a firm's ability to establish flexibility in its operational activities and to internally synchronize activities across departments involves the presence of internal integration systems and routines. Firms that have proper internal platforms (e.g., IT infrastructure) to share information internally and to coordinate among different functions are arguably in a better position to establish similar external integration systems and routines. Building on prior literature (Engelhardt-Nowitzki, 2012; Koufteros, Vonderembse, & Jayaram, 2005; Zhang et al., 2003; Zhao et al., 2011), this study argues that a firm's internally-oriented ability to maintain flexible value chains has a positive effect on its externally-oriented ability to integrate customers into their operational activities and to share customer intelligence.

Hypothesis 2: Value chain flexibility positively relates to customer integration.

2.3 Customer Integration and Sustainability Performance

According to recent research (Cronin, Smith, Gleim, Ramirez, & Martinez, 2011; Hult, 2011), the effectiveness of flexible adaptations at the operational level requires the incorporation of a holistic and accurate picture of the firm's business environment. By involving external partners, firms access the 'voice of the environment' when adapting their operational activities in the pursuit of sustainability-oriented strategies (Hart & Dowell, 2011; Pujari, 2006). By this means, they improve their internal stock of knowledge resources (Arya & Lin, 2007; Lavie, 2006; Berchicci, 2013) and reduce technology and marketing uncertainties that emerge from sustainability-oriented strategies (Hoffmann, 2007; Wolf, 2011). Sheth, Sethia, and Srinivas (2011, p. 23), in this context, equally argue that the involvement of and orientation towards stakeholders "has a significant bearing on a company's sustainability performance".

Among the firm's external stakeholders, customers play a predominant role (Lau, Tang, & Yam, 2010; Nambisan, 2002). Following prior literature (Daub & Ergenzinger, 2005; Sheth et al., 2011), customers embody the perspectives of multiple stakeholders and, for example, take on the role of "a citizen, a parent, an employee, a community member, or a member of the global village with a long-term stake in the future of the planet" (Smith, Drumwright, & Gentile, 2010, p. 4). Accordingly, customers are a vital source of knowledge that embody various social identities (e.g., Homburg, Wieseke, & Hoyer, 2009; Rowley & Moldoveanu, 2003). By exploiting this knowledge through customer integration, firms can access first-hand information on customer needs that does not only cover individual economic needs but also environmental and social demands. Apart from supporting the early consideration of sustainability-related demands during the development and production of sustainable products and services, customer integration also supports the successful adoption of these products and services in the marketplace (Berns et al., 2009; Kiron, Kruschwitz, Haanaes, Reeves, Fuisz-Kehrbach, & Kell, 2015). Through the integration of customers into operational activities, firms are in a better position to fully understand and incorporate the implications that emerge from the introduction of sustainable solutions such as changes in consumption patterns or product life cycles. Since customers provide direct and early feedback on the design, functionality, usability, and the overall performance of sustainable solutions, they support firms in reducing uncertainties and the risk of time-consuming changes (e.g., Fang, 2008; Koufteros et al., 2005; Reay & Seddighi, 2012). Hence, by providing valuable insights on the external environment and enhancing the adoption of sustainable solutions, integrated customers contribute to the firm's sustainability performance. Concurring with prior literature (e.g., Hart, 1995; Nidumolu et al., 2009), this study, therefore, proposes customer integration as a key resource for achieving competitive advantage that emerges from satisfying sustainability-related demands.

Hypothesis 3: Customer integration positively relates to sustainability performance.

3. Methodology

3.1 Sample and Key Informant Check

The study's data is from an online survey of top-level managers employed by chemical firms located in Germany. The chemical industry reflects an industry that faces significant pressure to become more sustainable and shows successful business cases for sustainability (e.g., Hart and

Milstein, 2003; Jenck, Agterberg, & Droescher, 2004; Kiron et al., 2013). Apart from advertising the study in a practitioner-oriented magazine, the scholars collaborate with the German Chemical Industry Association and also directly invite top-level managers, via email, to participate in the online survey.

The study applies a key informant approach for data collection and solely includes the responses of top-level managers in the final dataset. To reduce the potential risk of participants responding to questions beyond their level of responsibility, this study eventually applies the following key informant criteria: (i) involvement in strategic, innovation, and operational decision making, (ii) job title, (iii) job experience, and (iv) organizational tenure (Appendix A). The study excludes all respondents that do not indicate top-level positions or score lower than five on a seven-point Likert scale, ranging from ‘not at all involved’ (1) to ‘highly involved’ (7). Out of 286 respondents, the study discards 187 participants due to incomplete replies (145) and mismatches with the key informant criteria (42). Subsequently, the sample of this study comprises 99 key informants. Due to the difficulty in exactly determining the number of top-managers that actually receive the invitation (e.g., due to undeliverable email invitations), the calculation of the response rate refers to participants starting the online survey (e.g., Joshi, Kathuria, & Porth, 2003), which eventually leads to a response rate of 34.61%.

Since the exclusion of participants due to non- or incomplete replies might potentially threaten the generalizability of the present findings, two post-hoc analyses account for the potential threat of non-response bias and test for differences between (i) early and late respondents (Armstrong & Overton, 1977; Li & Calantone, 1998), and (ii) participants that complete the survey and participants that abandon. Following Li and Calantone (1998), the first

75% of respondents refer to early respondents while the last 25% relate to late respondents. A Mann-Whitney U-test eventually reveals no significant differences between the different groups.

3.2 Measures and Control Variables

The proposed research model consists of the following four measures (see Appendix B): a five-item construct, adapted from Zhou and Wu (2010), measures strategic flexibility; a six-item construct, adapted from Nair (2005), measures value chain flexibility; and a four-item construct, adopted from Koufteros et al. (2005), measures customer integration. The study introduces sustainability performance as a new performance measure to operationalize competitive advantage that results from meeting the needs of organizational stakeholders while simultaneously considering human welfare and ecological constraints (Chow & Chen, 2012; Nidumolu et al., 2009). The measures firm age and firm size represent two control variables. While the number of years since the firm's inception indicates the firm's age, the number of full-time employees, using a 6-point logarithm scale, indicates the firm's size. A dummy variable, coded 1 for pure manufacturing firms, further controls whether the type of firm (manufacturing vs. service) potentially effects the outcome.

3.3 Common Method Variance

To reduce the potential risk of common method bias that might derive from the use of self-reported data, this study applies a questionnaire with different Likert-type scales as well as places dependent and independent variables into different sections of the questionnaire (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Nevertheless, to test whether common method bias sill represents a potential threat to the present findings, this study includes a common method variance factor that comprises all principal constructs' indicators in the structural model analysis using PLS (Podsakoff et al., 2003, Liang, Saraf, Hu, & Xue, 2007). The ratio of the average substantive explained variance to the average common method based variance is 101:1. In addition, this research applies a PLS marker variable approach to account for common method variance (Rönkkö & Ylitalo, 2011). The marker variable consists of a selection of items that show the lowest and most consistent correlation with the items of the focal constructs of this study. Since the minimum number of marker items equals the number of items of the focal construct with the most indicators (here: value chain flexibility), six items constitute the marker variable. The marker items belong to constructs such as key processes, key resources, and profit formula. The mean correlation between the marker items and the items of the focal constructs is 0.17. The marker items eventually form a method construct as an exogenous variable that predicts each endogenous construct of the proposed research model. A comparison with the baseline model reveals that none of the significant regression paths of the baseline model becomes not significant. Hence, the PLS marker variable approach reveals that common method bias might not be a threat in the data of this study.

4. Analysis and Results

As prior literature acknowledges, the "misspecification of measurement models can bias inner model parameter estimation (e.g., Gudergan, 2005) and lead to incorrect assessments of relationships in PLS path modeling" (Gudergan, Ringle, Wende, & Will, 2008, p. 1239). Hence, since an incorrect pre-determination of the nature of the underlying measurement model can lead to misinterpretations, this study conceptualizes the core constructs from different perspectives (i.e., composite model and common factor model) and analyzes whether different specifications might lead to different conclusions. While the utilization of a common factor model implies the interpretation of the constructs used in this study from a behavioral point of view (i.e., interpretation as soft concepts), the specification of these constructs as composites implies the interpretation from a managerial point of view (i.e., interpretation as strong concepts) (Henseler et al., 2016).

For the estimation and analysis of the composite model, the study applies partial least squares (PLS), which represents a commonly used variance-based structural equation modeling technique in various literatures, such as marketing (e.g., Hair, Sarstedt, Ringle, & Mena, 2012) and strategic management (e.g., Bauer & Matzler, 2014). The ongoing research on PLS continuously leads to advancements (e.g., consistent PLS, heterotrait-monotrait ratio of correlations, indicator for global model fit) that make PLS an even more rigor estimation method and further extend its field of applicability (Dijkstra & Henseler, 2015a,b; Henseler & Sarstedt, 2013; Henseler, Hubona, & Ray, 2016). For the estimation and analysis of the common factor model, this study applies PLSc as an important advancement to conventional PLS (Dijkstra & Henseler, 2015a,b). PLSc corrects the estimates of reflectively measured constructs deriving from the traditional iterative PLS algorithm by employing a new reliability coefficient: the Dijkstra-Henseler's rho (p_A).

This study derives its findings from an analysis with Adanco 1.2 (Henseler & Dijkstra, 2014), using 300 as the maximum iteration, 10^{-6} as a stop criterion, and the factor weighting as inner weighting scheme.

4.1 Evaluation of Measurement Model

Following Henseler et al. (2016), the study assesses the composite constructs by means of their weights. All measurement items significantly and substantially contribute to the corresponding composite. The highest value of indicator multicollinearity refers to 4.02. With regard to the common factor constructs, this study firstly assesses the measurement model by means of the outer loadings. The estimation with PLSc reveals some outer loadings that are slightly below the recommend threshold of 0.70 (see Table 1). In order to compare the results from the estimation with PLS and PLSc, the study does however not discard these measurement items (Gefen, Straub, & Rigdon, 2011). A separate analysis, which discards all measurement items with loadings below 0.70, shows that the resulting effects remain stable for all hypothesized relationships.

Table 1 here.

Furthermore, this study refers to the Dijkstra-Henseler's rho (p_A) reliability coefficient in order to assess internal consistency reliability (Dijkstra & Henseler, 2015a). Table 2 shows that the reliability coefficient ρ_A of each measurement construct is above the proposed cut-off value of 0.70 (Hair, Ringle, & Sarstedt, 2011; Henseler, Ringle, & Sinkovics, 2009; Nunnally & Bernstein, 1994). The average variance extracted (AVE) values of all measurement constructs indicate satisfactory convergent validity (see Table 2). To further assesses discriminant validity on the indicator level, this study refers to the cross loadings. Appendix B shows that each indicator loading with its associated construct exceeds its loading with each of the other constructs (Hair et al., 2011; Henseler et al., 2009). This study also follows the most recent literature (Henseler, Ringle, & Sarstedt, 2015; Voorhees, Brady, Calantone, & Ramirez, 2016) and applies the heterotrait–monotrait ratio (HTMT) criterion to additionally assess discriminant validity (see Table 3). The fulfillment of the $HTMT_{0.85}$ criterion as well as the $HTMT_{inference}$ test eventually indicates adequate discriminant validity (Henseler et al., 2015; Kline, 2011).

Tables 2 and 3 here.

4.2 Results of Structural Model

While the study estimates the path coefficients with the path method, bootstrapping procedure with replacement (5000 resamples) generates the corresponding standard errors. Figure 2 and Table 4 include the results of both the PLS and PLSc analyses.

Figure 2 and Table 4 here.

This study further assesses the structural model by means of its R^2 values. Since the results indicate a R^2 (PLS/PLSc) value of 0.27/0.33 for value chain flexibility, 0.29/0.36 for customer integration, and 0.38/0.44 for sustainability performance, the proposed research model shows moderate to substantial prediction power (Chin, 1998). The calculation of Cohen's f^2 values (see Table 5) further allows the evaluation of the effect size of the predictor constructs (Cohen, 1988; Henseler et al., 2009).

Table 5 here.

The proposed research model further includes a mediation effect of value chain flexibility and customer integration in the strategic flexibility-sustainability performance relationship (see Figure 1). Since the indirect effect between strategic flexibility and sustainability performance is significant (PLS: $\beta = 0.28$, $p < 0.01$; PLSc: $\beta = 0.36$, $p < 0.01$) and the direct effect is not significant (PLS: $\beta = -0.11$, $p = 0.27$; PLSc: $\beta = -0.17$, $p = 0.17$), the structural equation model of both estimation methods disclose a full mediation effect between strategic flexibility and sustainability performance (Baron & Kenny, 1986; Zhao et al., 2010).

4.3 Model Fit

To assess the overall model fit, this study follows Henseler et al. (2014) and refers to the standardized root mean square residual (SRMR) as an index for model validation. Scholars generally consider values below 0.08 as favorable (Hu & Bentler, 1999) in this instance. While the model estimation with PLS reveals a SRMR value of 0.06 (HI95: 0.16, HI99: 0.17), the estimation with PLSc indicates a SRMR value of 0.07 (HI95: 0.17, HI99: 0.19).

4.4 Prediction Analysis

The local (measurement and structural model) and global (over model fit) assessment of the proposed research model test whether the proposed research model shows adequate explanatory ability, i.e., whether it properly explains the relationship between strategic flexibility and sustainability performance. A good explanatory ability of the proposed research model however does neither include nor exclude that the model also performs well in terms of its prediction ability (e.g., Armstrong, 2012; Gigerenzer & Brighton, 2009; Shmueli, 2010). Hence, this study follows recommendations of prior literature (e.g., Armstrong, 2012; Chin, 2010; Woodside, 2013) and additionally evaluates the prediction ability of the proposed research model. Since prior literature does not sufficiently explore the predictive capability of PLSc yet, this research solely refers to the prediction analysis of the model estimation with PLS. To assess prediction validity by means of a blindfolded cross validation analysis, this study refers to the software package SmartPLS 2.0 M3 (Ringle, Wende, & Will, 2005). A blindfolding procedure, which uses an omission distance of 5 and the cross-validated redundancy approach, reveals the Stone-Geisser Q^2 values (Hair et al., 2012). Since all values are greater than zero, all endogenous constructs show adequate predictive abilities (Götz, Liehr-Gobbers, & Kraft, 2010; Henseler et al., 2009). Table 6 further indicates the relative prediction relevance (q^2) of each predictor variable for the endogenous constructs of the proposed research model. While the *Q/q*-square measures evaluate the predictive validity at the item level, prior literature recommends to also assess predictive validity at the construct level (Chin, 2010; Shmueli, Ray, Velasquez Estrada, & Chatla, 2015). In addition, this study follows the data-splitting and randomly divides the data set into a training sample (n = 66) and a hold-out sample (n = 33) (Boßow-Thies & Albers, 2010; Shmueli et al., 2015). The estimation of the training sample leads to β- and p-values that only slightly differ from those deriving from the full data set. The study uses the weights and β-values deriving from the training sample to predict the new data of the hold-out sample. A comparison of the predicted and calculated values of the construct scores leads to the following correlations: customer integration (0.38), value chain flexibility (0.30), and sustainability performance (0.42). The corresponding values of the root-mean-square error (RMSE) are: customer integration (0.93), value chain flexibility (0.99), and sustainability performance (0.93).

Table 6 here.

4.5 Data Analysis Using fsQCA

A reanalysis of the given data using a fuzzy-set qualitative comparative analysis (fsQCA) (Fiss, 2011; Woodside, 2013) allows a more elaborate disclosure of which alternative combinations of organizational capabilities firms might rely upon in the pursuit of superior sustainability performance. The study uses the fsQCA 2.5 software package to perform the analysis and refers to the unstandardized latent variable scores of the core measures of the SEM research framework, comprising strategic flexibility (SF), value chain flexibility (VCF), customer integration (CI), and sustainability performance (SP). In addition, the study transforms these variables into structured fuzzy sets that range from 0 (full non-membership) to 1 (full membership), and sets the cross-over point at the middle of the seven-point Likert scale (4), the threshold for full membership close to the maximum score (6), and the threshold for non-membership close to the minimum score (2) (Ragin, 2008). For the analysis of the truth-table, the study sets the minimum number of cases per configuration at two and the minimum consistency level at 0.80, which indicates a clear drop in consistency in the ordered consistency values from the truth table (Leischnig & Kasper-Brauer, 2015). While the notion (c)/(p) indicates a core/peripheral condition, the notion ~ indicates the absence of a condition. The fsQCA eventually reveals a solution coverage of 0.84 and an overall solution consistency of 0.76. The analysis of the complex, parsimonious, and standard solutions within fsQCA reveals the following two configurations: (i) SF (p) * VCF (c) (raw coverage: 0.43, unique coverage: 0.12, consistency: 0.77) and (ii) ~SF (c) * CI (c) (raw coverage: 0.73, unique coverage: 0.41, consistency: 0.82). These findings reveal the existence of alternative combinations of organizational capabilities, and infer that the prevalent role of one of the two operational capabilities (i.e., value chain flexibility and customer integration) depends on the level to which a firm has already developed the ability to flexibly adapt its strategies and reallocate organizational resources in response to environmental changes.

5. Discussion

The goal of this research is to reveal how a compilation of organizational capabilities at the strategic and operational level is linked to sustainability performance. As the results of this study show, strategic flexibility precedes value chain flexibility in the pursuit of superior sustainability performance. Whereas the former ensures the flexible (re-)investment of resources at the strategic level (i.e., determining the long-term direction of the firm), the latter ensures the flexible and consistent application of these resources at the operational level (i.e., determining the short-term direction of the firm). The flexible redeployment of organizational resources nurtures value chain flexibility and increases the firm's flexibility in manufacturing numerous product variations, adapting production volumes, exploiting various distribution channels, and adapting outgoing orders to suppliers (Gerwin, 1993; Zhang et al., 2003; Zhang et al., 2002). The findings of this study further show that value chain flexibility promotes customer integration, which, in turn, is an important driver of sustainability performance. A firm's coordination and communication capabilities as well as its internal information-sharing systems (e.g., enterprise-resource-planning or product-lifecycle-management) support customer integration, which ensures the actual integration of external information into the firm's operational activities. Further, a firm's close contact with its customers (e.g., through on-site visits or joint testing of prototypes) enables the firm to acquaint the latest changes in environmental and social requirements and receive direct feedback on the design, functionality, usability, and the overall performance of their sustainable solutions (Koufteros et al., 2005; Zhao et al., 2011). The inherent value and rareness of this information eventually explains why firms that integrate their customers tend to outperform their competitors in terms of sustainability.

The present study examines a saturated research model in order to control for potential direct effects within the mediated relationships, and goes on to show that strategic flexibility also directly influences customer integration, and value chain flexibility has a direct effect on sustainability performance. The reanalysis of the given data using a fuzzy-set qualitative comparative analysis (fsQCA) helps to understand this complex, multipath relationship in greater detail.

On the one hand, firms with a high level of strategic flexibility rely predominantly on the ability to redesign and adapt their operations in order to transform the initiated, broader changes at the strategic level into concrete and coherent actions, and, thereby, to ensure alignment with their sustainability-oriented strategy across the value chain. The active integration of external information through customer integration remains secondary. This finding eventually concurs with the results from the SEM analysis, indicating that value chain flexibility influences sustainability performance directly as well as indirectly via customer integration. Value chain flexibility might be sufficient to achieve superior sustainability performance when firms act in unfamiliar territories (e.g., seizing an opportunity outside the current area of operation). In this context, the channels for integrating customers are very often not fully developed or the customer base itself has not fully emerged (Danneels, 2003; Govindarajan, Kopalle, & Danneels, 2011). The firm's sustainability performance might depend less on its ability to integrate customers, and more on its ability to dynamically adapt its operations to the new business environment.

On the other hand, the present sample comprises a sub-group of firms that have a less developed ability to flexibly reallocate organizational resources in the pursuit of alternative strategies, but nonetheless experience a comparable level of sustainability performance. These firms rely predominantly on the involvement of customers in achieving superior sustainability performance. The sole integration of customers might be sufficient to achieve superior sustainability performance when firms act in business environments that already comprise a strong orientation towards a sustainable development. The firm's sustainability performance might depend less on its ability to initiate long-term changes in response to major environmental changes, and more on its ability to continuously monitor the degree to which customers are satisfied with the existing sustainable solutions. Customer integration enables firms to exploit customers' knowledge on existing shortcomings and to timely and adequately adapt their solutions (Fang, 2008; Reay & Seddighi, 2012). By this means, firms are in a better position to more holistically satisfy the demand for sustainable products and services.

6. Implications

This study explores which organizational capabilities explain sustainability performance and, thereby, provides valuable guidance for both future research and business practice. These findings eventually disclose that the ability of a firm to adapt its strategies and reallocate organizational resources represents an important enabler of sustainability performance, though the effect is only indirect with value chain flexibility and customer integration representing two important mediators. While flexibility in resource allocation enables adequate investments in new manufacturing technologies, supply chain solutions, or new and diverse relationships with external partners, the resulting implications on sustainability performance are more nuanced. This study concurs with the dynamic research-based view (Eisenhardt & Martin, 2000; Teece et al., 1997) and shows that strategic flexibility, as an important dynamic capability, solely contributes to sustainability performance through an impact on operational capabilities, namely value chain flexibility and customer integration.

This study further contributes to the ongoing research on SEM by specifying the corresponding measurement model as both common factor model and composite model. This is, to the best of the researchers' knowledge, one of the first studies within management research that utilizes the underlying measurement model from two different measurement philosophies: common factor model and composite model. The comparison of the outer loadings and the path coefficients eventually reveals lower values of the outer loadings and higher values of the path coefficients for the model estimation using PLSc in comparison to conventional PLS. The small differences between the estimates deriving from PLS and PLSc eventually indicate that the undertaken correction by PLSc is rather weak, corresponding with the high values of the reliability coefficient ρ_A. Similarly, the evaluation of the global model fit by means of SRMR provides support that the specification of the measurement model as common factor model as well as composite model fit with the present data. The slightly higher overall model fit of the composite model might derive from the fact that composite models are less restrictive than factor models (Landis, Beal, & Tesluk, 2000). While the utilization of common factor models implies to interpret the dynamic and operational capabilities of the proposed research model as certain aggregated patterns in the behavior and attitude of the firm's employees (Wright & Snell, 1998), the utilization of composite models implies the consideration of managerial instruments that stimulate the emergence or progress of a certain occurrence (Henseler et al., 2016).

The present study also entails some important managerial implications. To achieve superior sustainability performance, managers need to create managerial processes, incentive systems, and strategic decision-making tools that allow a company to successfully and repeatedly reallocate resources and build new competences pertaining to sustainable development. The ability of a firm to flexibly reallocate its resources may prove advantageous to firms that aim to improve their sustainability performance. However, the findings also show that it is not sufficient for managers to emphasize flexibility in resource allocation without promoting the adaption of structures and processes at the operational level. Operational capabilities that target the coordination and execution of operational activities as well as the integration of external information into operational activities also play an important role in achieving high levels of sustainability performance. To create the necessary operational routines, metrics, and behaviors, managers could consider to invest in, for instance, internal information-sharing systems (e.g., customer-relationship-management (CRM), product-lifecycle-management (PLM), or supply-chain-management (SPM) systems), encourage operations managers to align operational activities across the value chain, and support employees in getting into close contact with the firm’s customers to learn about economic, ecological, and social needs (e.g., through on-site visits, invitations to concept development workshops, or joint testing of prototypes).

To further exemplify the practical relevance of the study, this study refers to the case of the chemical company BASF. BASF builds on their concept of batteries for more sustainable mobility, such as e-mobility, by strategically investing more than US$100 million in acquisitions and partnerships in the field of new battery technologies, and ultimately creates a new business unit called “Battery Materials” in 2012. BASF’s new unit, however, results not only from the flexible allocation of resources, but also from the alignment of operational activities along the entire battery value chain (e.g., BASF is coordinating short-term manufacturing and marketing capacities among a diverse portfolio of battery materials) and exploiting customers’ know-how (in what BASF calls an “application testing network” to address customers' requirements). Hence, in addition to flexibility in resource allocation, both value chain flexibility and customer integration are important drivers of BASF’s long-term strategy to significantly contribute to the development of more sustainable mobility concepts.

7. Limitations and Future Research

The findings of the present study emerge from the use of cross-sectional data. To validate these findings and, for instance, to rule out an endogeneity bias, future scholars should consider the use of panel data, an experimental design, as well as the use of proper instrumental variables. By proposing and applying adequate instrumental variables future scholars can also foster the feasibility and establishment of instrumental variables as testing technique for endogeneity within PLS research (McIntosh, Edwards, & Antonakis, 2014). The use of cross-sectional data further limits the scholars to make any causal inferences. Future research should consider this in particular. In addition, because of the relatively small sample size and the industry specific context of this study, future research can also replicate the study in other industries and with larger sample sizes. While the present study merely refers to the SRMR as approximate measure of fit (Henseler et al., 2014), future scholars should also consider the use of various fit indices once additional approximate model fit criteria (e.g., Bentler-Bonett index or normed fit index (NFI)) exist for the commonly used PLS software packages.

As this study points at the complex relationships between dynamic and operational capabilities in the pursuit of sustainability performance, future research should also consider the role of other dynamic as well as operational capabilities that explain sustainability performance. On the one hand, future research should consider additional operational capabilities that might explain the relationship between strategic flexibility and customer integration, as well as value chain flexibility and sustainability performance, and, thereby, disclose the strategic flexibility-sustainability performance relationship in its entirety. On the other hand, future studies should investigate additional dynamic capabilities that impact sustainability performance, such as strategic learning capability or alliance management capability. For example, as companies increasingly rely on alliances with various external partners (e.g., customers, suppliers, or NGOs) to become more sustainable (Kiron et al., 2015), future research could explore how a firm's ability to effectively manage a portfolio of alliances might act as an important dynamic capability to modify the firm's resource-base in the quest to become more sustainable.

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Appendix A: Descriptive Statistics

Key Informant Descriptive Statistics		**Firm Descriptive Statistics**	
Job Title		**Firm Size (Number of Full Time Employees)**	
CEO	15	1-10	3
CTO	1	11-50	8
Vice President	1	51-250	6
Executive Director	1	251-1000	14
Director	4	1.001-50.000	53
Chairman	2	> 50.000	15
Business Unit Manager	5		**AVG (SD)**
Head of Department	21	**Firm Age** (in ears)	86.10 (53.68)
Senior Manager	2		
Partner	1		
Operations Manager	6		
General Manager	40		
Involvement in…	**AVG (SD)**		
… strategic decision making	5.14 (1.72)		
… innovation decision making	5.39 (1.52)		
… operational decision making	4.91 (1.77)		
Organizational tenure (in years)	12.64 (9.87)		
Overall work experience (in years)	19.87 (10.23)		
Age (in years)	46.23 (11.35)		

Appendix B: Measures

	ME	SD	1	2	3	4
1. Strategic Flexibility (Zhou and Wu, 2010)						
SF 1 The flexible allocation of marketing resources (including advertising, promotion and distribution resources) to market a diverse line of products.	4.36	1.37	**0.76**	0.24	0.32	0.24
SF 2 The flexible allocation of production resources to manufacture a broad range of product variations.	4.39	1.58	**0.81**	0.38	0.36	0.16
SF 3 The flexibility of product design (such as modular product design) to support a broad range of potential product applications.	4.39	1.53	**0.76**	0.25	0.32	0.10
SF 4 The redefinition of product strategies in terms of target market segments.	4.70	1.47	**0.90**	0.48	0.35	0.21
SF 5 The reallocation of organizational resources to support the firm's intended product strategies.	4.34	1.42	**0.82**	0.47	0.33	0.15
2. Value Chain Flexibility (Nair, 2005)						
VCF 1 We have a flexible program of special services that can be matched to changing customer requirements.	4.29	1.70	0.40	**0.75**	0.40	0.28
VCF 2 We have established a program to authorize and perform special requests made by selected customers	4.89	1.65	0.39	**0.78**	0.38	0.25
VCF 3 We are able to accommodate a wide range of unique customer requests by implementing pre-planned solutions.	4.36	1.70	0.41	**0.84**	0.39	0.47
VCF 4 We have adequate ability to share both standardized and customized information externally with suppliers and/or customers.	4.54	1.66	0.35	**0.89**	0.34	0.39
VCF 5 We have adequate ability to share both standardized and customized information internally.	4.87	1.57	0.33	**0.84**	0.41	0.49
VCF 6 We have increased operational flexibility through supply chain collaboration.	4.20	1.61	0.35	**0.72**	0.34	0.33
3. Customer Integration (Koufteros et al., 2005)						
CI 1 In developing the product concept, we listen to our customer needs.	5.67	1.28	0.41	0.48	**0.84**	0.32
CI 2 We visit our customers to discuss product development issues.	5.70	1.31	0.29	0.34	**0.88**	0.35
CI 3 We study how our customers use our products.	5.53	1.29	0.43	0.42	**0.88**	0.43
CI 4 Our product development people meet with customers.	5.26	1.45	0.22	0.32	**0.74**	0.38
4. Sustainability Performance						
SP 1 We are the first that offer environmental-friendly products/services at the marketplace.	4.37	1.62	0.21	0.43	0.43	**0.90**
SP 2 Our competitors consider us as a leading company in the field of sustainability.	4.09	1.67	0.18	0.44	0.33	**0.92**
SP 3 We develop new products/services or improve existing products/services that are regarded as sustainable for society and environment.	4.59	1.79	0.20	0.40	0.42	**0.90**
SP 4 Our reputation in terms of sustainability is better than the sustainability reputation of our competitors.	4.48	1.68	0.16	0.39	0.36	**0.88**
SP 5 Compared to our competitors, we more thoroughly respond to societal and ethical demands.	4.37	1.55	0.21	0.42	0.42	**0.88**

Notes: ME = Mean; SD = Standard Deviation.

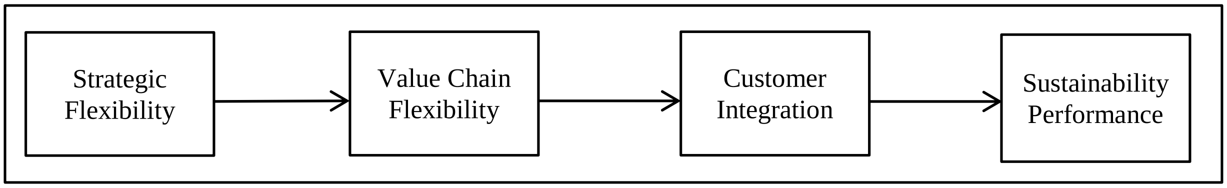

Figure 1. Proposed Research Model

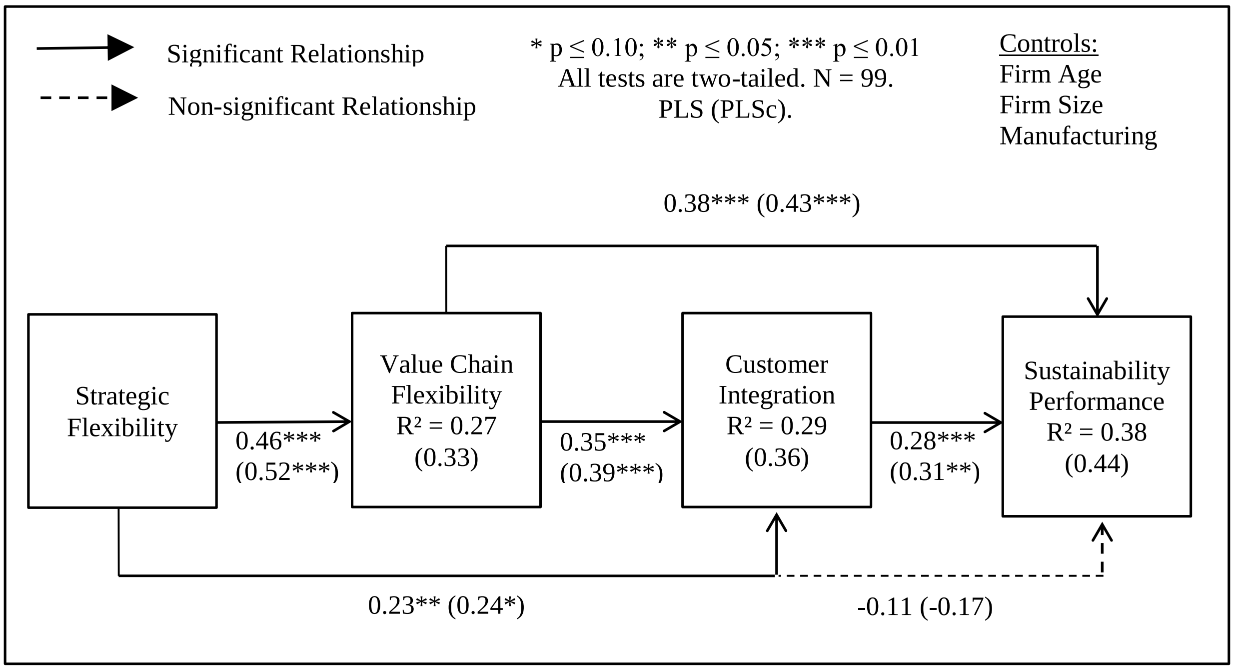

Figure 2. Results of structural equation modeling with PLS and PLSc

Table 1. Outer loadings and weights

	Strategic Flexibility			Value Chain Flexibility			Customer Integration			Sustainability Performance		
	loadings		weights	loadings		weights	loadings		weights	loadings		weights
	PLS	PLSc	PLS/PLSc	PLS	PLSc	PLS/PLSc	PLS	PLSc	PLS/PLSc	PLS	PLSc	PLS/PLSc
SF_1	0.76	0.64	0.21									
SF_2	0.81	0.79	0.26									
SF_3	0.76	0.59	0.19									
SF_4	0.90	0.90	0.29									
SF_5	0.82	0.85	0.27									
VCF_1				0.75	0.73	0.20						
VCF_2				0.78	0.71	0.19						
VCF_3				0.84	0.86	0.23						
VCF_4				0.89	0.74	0.20						
VCF_5				0.84	0.83	0.23						
VCF_6				0.72	0.69	0.19						
CI_1							0.84	0.83	0.32			
CI_2							0.88	0.72	0.27			
CI_3							0.88	0.90	0.34			
CI_4							0.74	0.65	0.25			
SP_1										0.90	0.92	0.24
SP_2										0.92	0.84	0.22
SP_3										0.90	0.93	0.24
SP_4										0.88	0.79	0.21
SP_5										0.88	0.84	0.22

The p-values of all loadings and weights are below 0.01.

Table 2. Properties of measurement scales and correlations

	ME	SD	p_A	AVE	1	2	3	4	5	6
1. Strategic Flexibility	4.44	1.20	/ (0.89)	/ (0.58)						
2. Value Chain Flexibility	4.54	1.33	/ (0.90)	/ (0.58)	0.46 (0.52)					
3. Customer Integration	5.55	1.11	/ (0.87)	/ (0.61)	0.42 (0.47)	0.47 (0.53)				
4. Sustainability Performance	4.38	1.49	/ (0.94)	/ (0.75)	0.21 (0.23)	0.47 (0.51)	0.44 (0.48)			
5. Firm Age	86.10	53.68	-	-	0.10 (0.11)	0.08 (0.09)	0.11 (0.11)	0.36 (0.37)		
6. Manufacturing	0.56	0.50	-	-	-0.03 (-0.03)	-0.23 (-0.25)	0.13 (-0.14)	-0.05 (-0.05)	0.00 (0.00)	
7. Firm Size	4.53	1.24	-	-	-0.03 (-0.04)	0.00 (0.00)	-0.08 (-0.09)	0.17 (0.17)	0.63 (0.63)	0.15 (0.15)

Note: ME = Mean. **SD** = Standard Deviation. $\mathbf{p_A}$ = Dijkstra-Henseler's rho. **AVE** = Average Variance Extracted. Values indicated as follows: PLS (PLSc).

Table 3. Heterotrait-monotrait ratio (HTMT)

	Strategic Flexibility		Value Chain Flexibility		Customer Integration		Sustainability Performance		Firm Age		Firm Size	
	HTMT	HTMT Inference	HTMT	HTMT Inference	HTMT	HTMT Inference	HTMT	HTMT Inference	HTMT	HTMT Inference	HTMT	HTMT Inference
Value Chain Flexibility	0.51	0.67										
Customer Integration	0.47	0.64	0.53	0.68								
Sustainability Performance	0.23	0.42	0.50	0.66	0.49	0.66						
Firm Age	0.11	0.29	0.09	0.27	0.10	0.29	0.37	0.53				
Firm Size	0.04	0.22	0.01	0.21	0.09	0.28	0.17	0.39	0.63	0.72		
Manufacturing	0.03	0.21	0.25	0.40	0.15	0.33	0.05	0.23	0.00	0.20	0.15	0.31

Table 4. Results of structural equation modeling with PLS and PLSc

	Value Chain Flexibility		Customer Integration		Sustainability Performance	
	β-value	p-value	β-value	p-value	β-value	p-value
Controls						
Firm Age	0.00 (-0.01)	0.97 (0.94)	0.16 (0.17)	0.10 (0.13)	0.33 (0.34)	<0.01 (<0.01)
Firm Size	0.05 (0.06)	0.67 (0.62)	-0.17 (-0.18)	0.10 (0.11)	-0.04 (-0.04)	0.77 (0.78)
Manufacturing	-0.23 (-0.24)	<0.01 (<0.01)	-0.02 (-0.01)	0.84 (0.92)	0.08 (0.10)	0.32 (0.24)
Main Effects						
Strategic Flexibility	0.46 (0.52)	<0.01 (<0.01)	0.23 (0.24)	0.05 (0.09)	-0.11 (-0.17)	0.27 (0.17)
Value Chain Flexibility			0.35 (0.39)	<0.01 (<0.01)	0.38 (0.43)	<0.01 (<0.01)
Customer Integration					0.28 (0.31)	0.01 (0.03)
R-Square	0.27 (0.33)		0.29 (0.36)		0.38 (0.44)	

All tests are two-tailed. N = 99. PLS (PLSc)

Table 5. Effect size (Cohen's *f²*)

Path	Effect size		
	R^2_{incl}	R^2_{excl}	Cohen's f^2
Strategic Flexibility – Value Chain Flexibility	0.27 (0.33)	0.06 (0.07)	0.29 (0.39)
Strategic Flexibility – Customer Integration	0.29 (0.36)	0.25 (0.32)	0.06 (0.06)
Strategic Flexibility – Sustainability Performance	0.38 (0.44)	0.38 (0.42)	0.00 (0.04)
Value Chain Flexibility – Customer Integration	0.29 (0.36)	0.21 (0.26)	0.11 (0.16)
Value Chain Flexibility – Sustainability Performance	0.38 (0.44)	0.29 (0.34)	0.15 (0.18)
Customer Integration – Sustainability Performance	0.38 (0.44)	0.33 (0.38)	0.08 (0.11)

Values presented as follows: PLS (PLSc).

Table 6. Relative prediction relevance (*q²*)

Path	Relative prediction relevance		
	Q^2_{incl}	Q^2_{excl}	q^2
Strategic Flexibility – Value Chain Flexibility	0.17	0.04	0.16
Strategic Flexibility – Customer Integration	0.18	0.15	0.04
Strategic Flexibility – Sustainability Performance	0.30	0.29	0.01
Value Chain Flexibility – Customer Integration	0.18	0.11	0.09
Value Chain Flexibility – Sustainability Performance	0.30	0.23	0.10
Customer Integration – Sustainability Performance	0.30	0.26	0.06

Values presented as follows: PLS (PLSc).