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Improving the execution of supply chain management in organizations

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ABSTRACT

The aim of this paper is to identify areas for improving the level of supply chain management (SCM) execution. A conceptual model was developed that proposes internal and joint SCM conditions and the adoption of SCM processes as the main antecedents of SCM execution. Based on a survey of 174 senior managers representing large organizations structural equation modeling was conducted followed by a three-step importance-performance analysis. The results show that internal SCM conditions, specifically information technology and human resources, are the major drivers for improving the total level of SCM execution.

1. Introduction

Kaihara (2001) has recognized supply chain management (SCM) as one of the best means to improve the performance of organizations. SCM is defined by Villa (2001) as the management of different types of physical, information and financial flows from the stage of raw material through to a final product where material suppliers, manufacturers, distributors and customers are connected. This complements the definition provided by the Council of Supply Chain Management Professionals (see www.cscmp.org). By being able to manage inbound supply and outbound distribution effectively, organizations gain competitive advantages as operations are processed faster, more flexibly and at less cost (Al-Mudimigh et al., 2004). This ability requires organizations to integrate SCM within their internal boundaries. Olhager and Selldin (2004) examined how Swedish organizations deal with specific supply chain issues while Kim (2007) analyzed different organizational set-ups and how these affect the performance of SCM. These investigations focused on the level of supply chain integration and subsequent SCM performance across different organization types.

However, to our knowledge the question of how much SCM an organization has undertaken and what drives this level of SCM execution have not been examined sufficiently. Kotzab et al. (2006a, b) conducted some exploratory work by analyzing a sample of Danish organizations. Building on these preliminary findings, the aims of this paper are twofold: (1) identify the antecedents of SCM execution and (2) establish an analysis procedure that allows for prioritizing the identified antecedents with respect to their existing performance.

For this purpose we first set up a conceptual model based on theory and literature that proposes certain antecedents of SCM execution. This model can be used to measure the level of SCM execution within organizations. Subsequently, we develop and apply a three-step importance-performance analysis approach (IPA) to demonstrate how the level of SCM execution within organizations may be increased. We then conclude the paper with a discussion and outlook section.

2. A model of SCM execution within organizations

The adoption and execution of SCM has been theorized by Bechtel and Jayaram (1997), Chen and Paulraj (2004), Cooper et al. (1997) or Mentzer et al. (2001), but there has been little empirical testing. The primary empirical studies include Cigolini et al. (2004), Fawcett and Magnan (2001), Kotzab et al. (2006a, b) and Wisner (2003). Following these authors, we have developed and empirically tested herein the following SCM adoption and execution framework, which consists of four major elements: (1) internal SCM conditions (ξ_1), (2) joint SCM conditions (ξ_2), (3) adoption of SCM-related processes (ξ_3) and (4) the execution of SCM within organizations (η_1) (see Appendix and Fig. 1).

The 'execution of SCM within organizations' is understood as a firm's internal and external integration of business processes with suppliers and customers in order to create value and to improve

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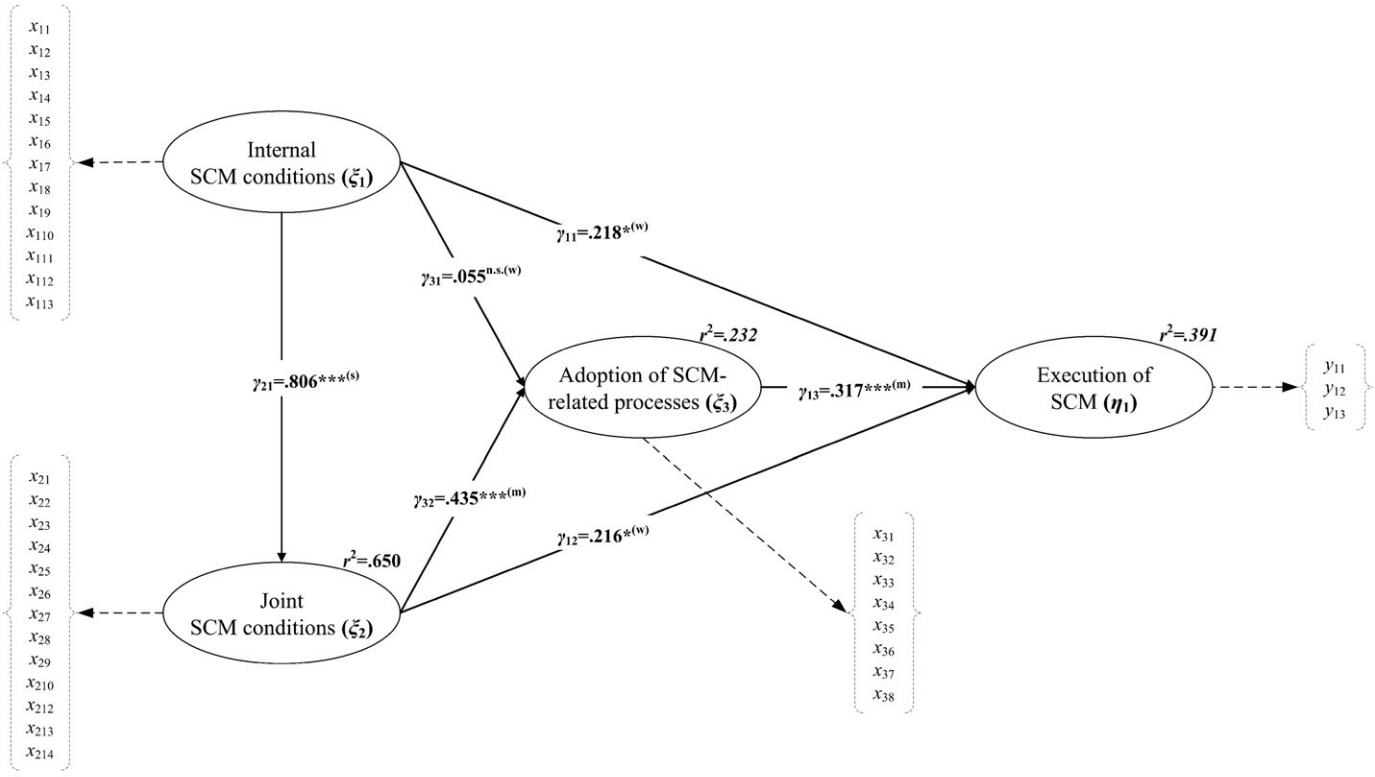

Caption: ξ_n, η_n, factors/constructs; γ_n, proposed effects; x_n, y_n, indicators behind factors; effect size (see f^2-values): w, weak effect, m, moderate effect; s, strong effect; *, t-values are significant (p<.05);**, t-values are significant (p<.01); ***, t-values are significant (p<.001); n.s., t-values are not significant (p>.05);
Notions: Sample size n=174; t-values calculated by applying a bootstrapping procedure with 1,000 sub-samples (Chin, 1998); f^2-values: $f^2(\gamma_{21})$>>.35; $f^2(\gamma_{31})$=.004; $f^2(\gamma_{32})$=.088; $f^2(\gamma_{11})$=.027; $f^2(\gamma_{12})$=.025; $f^2(\gamma_{13})$=.123;

Fig. 1. Conceptual model and modeling results.

the total performance of the chain (Cooper et al., 1997; Lambert et al., 1998). The level of the 'execution of SCM within organizations' though depends on the level of utilizing these processes internally within the organization and externally with suppliers and customers.

Therefore this element depends on 'SCM-related processes' which defined those practices that integrate or coordinate different key business areas within the firm and between a firm's suppliers and customers (Lambert et al., 1998). 'SCM-related processes' generate a flow of products, services and related information and create value for customers as well as improving the total performance of the chain (Al-Mudimigh et al., 2004; Fawcett and Magnan, 2001) and can be subdivided into eight areas (Cooper et al., 1997; Croxton et al., 2001; Lambert et al., 2005): (1) customer relationship management, (2) customer service management, (3) demand management, (4) order fulfillment, (5) manufacturing flow management, (6) supplier relationship management, (7) product development and commercialization and (8) returns management. 'SCM-related processes' include the dimensions of the customer, product flows and information flows and the direction of the flows is both downstream (forward to the customer) and upstream (backwards towards the supplier).

In order to generate or adopt these processes and consequently undertake SCM, fundamental requirements which we call 'SCM conditions' must exist within the organization and between participating parties (Mentzer et al., 2001). 'SCM conditions' can therefore be split into 'internal' and 'joint SCM conditions' (Kotzab et al., 2006a). 'Internal SCM conditions' are fundamental for originating SCM-related processes and the execution of SCM within the organization. They refer to commitment and dedication of human and financial resources, top management support, internal visions and goals, the staff's technical expertise, internal IT-systems, guidelines for information exchange, education, the establishment of internal project groups and processes as well as integration behavior (Bechtel and Jayaram, 1997; Chen and Paulraj, 2004; Cooper et al., 1997; Mentzer et al., 2001; Cigolini et al., 2004; Fawcett and Magnan, 2001; Lambert et al., 2005). As Childerhouse et al. (2004), Lambert (2004) or Lambert and Knemeyer (2004) have argued, some 'homework' has to be done internally before concentrating on an external integration of business processes with suppliers and/or customers. Therefore the construct of organizational behavior as one strategic component of SCM, including variables of culture, power and human resources were included as these prerequisites are needed to connect organizations within a network (Mentzer et al., 2001).

'Joint SCM conditions' are then the fundamental requirements that originate 'SCM-related processes' and the execution of SCM between organizations. They include shared performance measurement, planning and controlling systems, shared vision and goals, organizational structure, joint project groups, systems perspective, trust, long-term-oriented relationships, power, shared profits and risks, mutual dependency, shared information on inventory status, shared information on forecasts, shared information on product development, organizational culture and equivalent management methods (Chen and Paulraj, 2004; Mentzer et al., 2001; Lambert et al., 1998).

Based on the foregoing, our model proposes that the execution of SCM is directly affected by the adoption of SCM-related processes (γ_{13}, Cousins and Menguc, 2006), and by joint SCM conditions (γ_{12}, Lambert et al., 2005) and internal SCM conditions (γ_{11}, Mentzer et al., 2001). We further propose that internal SCM

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conditions also affects joint SCM conditions (γ_{21}, Cigolini et al., 2004; Lambert et al., 2005) and the adoption of SCM-related processes (γ_{31}, Droge et al., 2004). In turn joint SCM conditions are proposed to affect SCM-related processes (γ_{31}, Lambert, 2004). Thus, this model considers both direct and indirect effects towards the execution of SCM.

After having identified the 'root causes' of executing SCM within an organization, we were interested in measuring how much SCM within an organization exists as well as to identify the drivers for improving the execution level of SCM within organizations. As discussed in the next section, we have therefore calculated a performance index and developed an improvement tool based on the importance-performance analysis.

3. Importance-performance analysis

The importance-performance analysis stems from the marketing discipline and is a technique that is often applied for strategy formulation in service settings (see Martilla and James, 1977 or Lai and Cheng, 2003). The IPA is a tool with which an existing performance level of a variable, e.g. attribute, process or action, is compared to the potential of this variable to change the performance level of a (higher order) factor (Martilla and James, 1977; Levenburg and Magal, 2004). In our case it can be used to measure and prioritize SCM execution performance by analyzing all items and constructs in the proposed model (see Fig. 1). The three-step analysis procedure – presented in the following – builds on Johnson and Gustafsson (2000) and considers their recommendations to use variance-based structural equation modeling (PLS) as a basis for the analysis. Further, we refer to Kotzab et al. (2006b) who introduced this analysis approach to the field of SCM but utilized both exploratory factor analysis and multiple regressions to estimate the coefficients.

In a first step we calculate the performance index PI_{x_n} based on the rating values of each item x_n and for each construct ξ_m (η_m). The performance indices represent current (perceived) performance level of an item, e.g. availability of human resources for SCM (x_{11}), and a construct, e.g. Internal SCM conditions (ξ_1) (see Appendix). On an item level the ratings are comprised by calculating the PI utilizing the simple Eq. (1) of Anderson and Fornell (2000):

$$PI_{x_n} = \frac{\mu_{x_n} - \min(x_n)}{\max(x_n) - \min(x_n)} \quad (1)$$

where μ_{x_n} is the mean value of all ratings per item and $\max(x_n)$ is the highest and $\min(x_n)$ is the lowest rating value on the applied rating scale. Consequently, the derived index needs to be interpreted based on a 100 point scale (0=lowest possible performance; 100=highest possible performance).

In order to obtain a PI on a construct level, the relative importance or impact of each item within each construct must be taken into account. As a weighting variable the factor or outer weights can be used, which are provided in the PLS output. In the case of our model the outer weights are calculated as the covariances between the inner proxy of each construct, i.e. a linear combinations of its items, and the respective items (Lohmueller, 1989). Thus, the weights represent the relative impact of each indicator in measuring a factor (Tenenhaus et al., 2005). The index for the (higher order) factor PI_{ξ_m} or $PI\eta_m$,respectively, can be calculated as follows:

$$PI_{\xi_m} \text{ or } PI_{\eta_m} = \frac{\lambda_1 * PI_{x_1} + \lambda_2 * PI_{x_2} + \ldots + \lambda_n * PI_{x_n}}{\lambda_1 + \lambda_2 + \ldots + \lambda_n} \quad (2)$$

where λ_n are the factor/outer weights of item n and PI_{x_n} as defined in Eq. (1).

In a second analysis step the impact values of each item and the exogenous construct need to be identified. The impact values represent the potential of each item and exogenous construct to change the current performance level. As mentioned above, the impact of each item can be operationalized by factor or outer weights provided by the output of the PLS procedure. Johnson and Gustafsson (2000) and Kotzab et al. (2006a) used factor score weights from the exploratory factor analyses as impact values on an item level and the standardized regression weights from the multiple regressions. From estimating these coefficients simultaneously by applying the PLS procedure we can utilize the factor or outer weights as an impact factor for each item and the total effects for each construct, i.e. the sum of direct and indirect effects on the our endogenous construct execution of SCM (η_1). The calculation of the total effects related to our model can be seen from Table 1 and may also be compared to Fig. 1.

Table 1
Calculation of total effects.

Effect	Mediator(s)	Calculation (direct + total effects)	Total effect size
$\xi_1 \rightarrow \eta_1$	ξ_2, ξ_3	$\gamma_{11} + \gamma_{31} * \gamma_{13} + \gamma_{21} * \gamma_{32} * \gamma_{13}$	.520***
$\xi_2 \rightarrow \eta_1$	ξ_3	$\gamma_{12} + \gamma_{32} * \gamma_{13}$	.354***
$\xi_3 \rightarrow \eta_1$	–	γ_{13}	.317***

Caption: ***$p < .001$.

In a final step the PI are plotted against the impact value for all constructs. The diagrams are divided into quadrants using the mean values of each set of indices, i.e. PI and impact values, as thresholds. Thereby we receive a visual representation of the existing performance (level) of items and their potential to change the performance of the super ordinate construct. The position of each variable within the quadrant suggests the application of norm strategies as suggested by Johnson and Gustafsson (2000):

- focus on improvements, which represents SCM factors with a high impact but a low degree of execution;
- maintain or improve, which represents SCM factors with both a high impact and a high degree of execution;
- maintain or reduce, which represents SCM factors with a low impact but a high degree of execution; and
- no relevance, no resources needed, which represents SCM factors with both a low impact and a low degree of execution.

The aim of this visual representation of the combination of PI and impact values is to facilitate the comparison of states and potentials of each item. Thus, positions within each of the prioritization maps need to be interpreted in a relative and not in an absolute sense. As a consequence the allocation of each PI/impact point into the four norm strategy fields is seen as a general labeling of relative positions.

4. Empirical study

The model as outlined in Fig. 1 was tested in a central European SCM setting, i.e. Austria, where a postal survey was conducted. A structured self-administered questionnaire containing 45 questions using nominal and ordinal scales was developed. In order to ensure the linguistic equivalence of the German items with the English items the back translation procedure according to Behling and Law (2000) was applied. The questionnaire was pre-tested extensively before being used. We decided that senior managers of large organizations in the manufacturing, trade and service industries would serve as the most competent informants regarding the targeted subject matter.

The population corresponded to the 790 biggest Austrian organizations in the retail and manufacturing sectors per the

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ÖNACE-classification. A random sample of 200 was drawn from this population and within those organizations senior managers responsible for logistics and SCM, each representing one organization in the sample, were identified and contacted personally. A questionnaire was sent to them after pre-notification agreement. As a result of applying Dillman's (2007) tailored design method, we ended up with 174 usable questionnaires. This final sample consists of 38.5% manufacturing companies and 29.3% trading companies, whereas the rest is affiliated to the service, building and energy sector (32.2%). When comparing this distribution with the distribution in the selected population we see no significant difference (chi-square test; $\chi^2_{(2)}=2.811$; $p>.05$).

5. Results

5.1. Modeling results

To analyze the proposed effects between our four reflective latent constructs in both sample settings, we applied the Partial-Least-Square (PLS) approach (Tenenhaus et al., 2005; Chin, 1998; Lohmueller 1989; Wold, 1975), using the software SmartPLS (Ringle et al., 2005). This was motivated by the requirements of the PLS procedure in terms of sample size, level of measurement and multinormality compared to a co-variance based SEM-approach (Chin and Newsted, 1999; Fornell and Bookstein, 1982). The analyses contained two parts: (1) We first evaluated the measurement or outer models, i.e. the sets of constructs with the observable items standing behind them; and (2) we subsequently investigated the proposed effects between the latent constructs within the structural or inner models.

Measurement model: All *t*-values of the factor loadings prove to be highly significant ($p<.001$). All loadings exceed the suggested size of .7 (Hulland, 1999). The internal consistency can also be considered to be satisfactory for all factors (Cronbach Alpha; $\alpha>.7$) (Nunnally, 1978) and the composite reliability of all factors meets the requirement to be above .7 (ρ, Fornell and Larcker, 1981). The degree of the convergent validity proves to be acceptable with the average variances extracted (AVE) in the range of .5 or higher (Bagozzi and Yi, 1988). With regard to the constructs' discriminant validity, it can be said that the AVE is larger than the highest squared intercorrelation with every other factor in the measurement models (Fornell–Larcker-Ratio; FLR < 1, Fornell and Larcker, 1981).

Structural model: By following the notions of Chin (1998) we evaluated the structural models by using the coefficients of determination (r^2), the size, signs and significance of the single path coefficients (γ_n, β_n) and the effect sizes (f^2) (see Fig. 1).

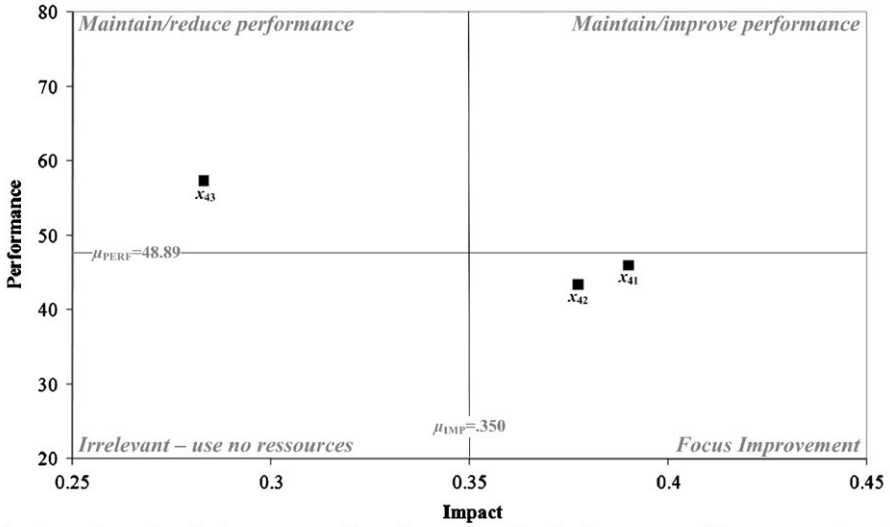
5.2. Performance indices and prioritization of improvement areas

By first looking at a construct level we see that the stage of SCM execution in the Austrian organizations is slightly below the middle of the performance index scale ($PI_{\eta_1}=48.08$). This is also the case for the index results of the joint SCM conditions ($PI_{\xi_2}=47.70$), which indicates that supplier and customer relations have improvement potential (see *y*-axis in Fig. 3). The PI of the internal SCM conditions ($PI_{\xi_1}=54.18$) is slightly above scale center, showing that these organizations have a moderate level of internal integration orientation set-up. Interestingly enough, the adoption of SCM-related processes obtained the highest result ($PI_{\xi_3}=64.62$), which is due to the ability of the organization to inform customers of their current order status, the integration of suppliers and customers in product development, as well as building up cooperation with important upstream and key players.

In order to identify those areas of improvement that are capable of increasing the level of SCM execution we first need to interpret the impact of all items of the execution factor itself and consequently work our way backwards in our model. The results of the importance-performance analyses reveal those factors and consequently items that need to be targeted by the organizations in our sample.

Fig. 2 shows the impact-performance matrix for the execution of SCM. There we see that internal integration of business processes (x_{43}) is on a satisfactory level but – relative to the other three items – shows a much lower impact on the factor. Thus, in order to improve total SCM execution, decision makers need to focus on the integration of business processes with suppliers (x_{41}) as well as with their customers (x_{42}). It seems that supply chain managers of the sample organizations have done their homework so far (Childerhouse et al., 2004; Lambert and Knemeyer, 2004) and can now start to extend their SCM efforts to the inbound and outbound side of their supply chains.

So what can be done to increase the performance of this key factor? From Fig. 3 we learn that the most powerful improvement potential lies with the internal SCM conditions since they have a



Caption: x_{41}, Integration of business processes with suppliers; x_{42}, Integration of business processes with customers; x_{43}, Internal integration of business processes within the company;

Fig. 2. Impact-performance matrix of the factor SCM execution (η_1).

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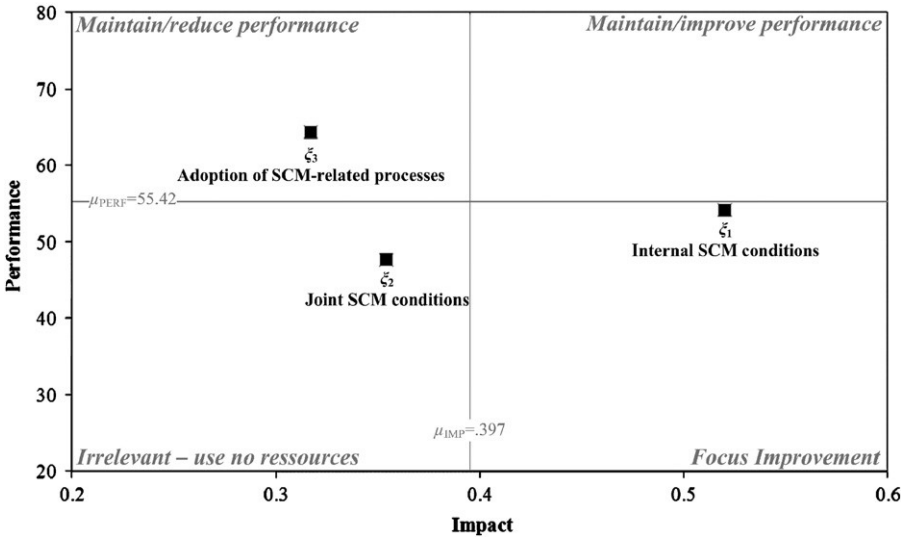
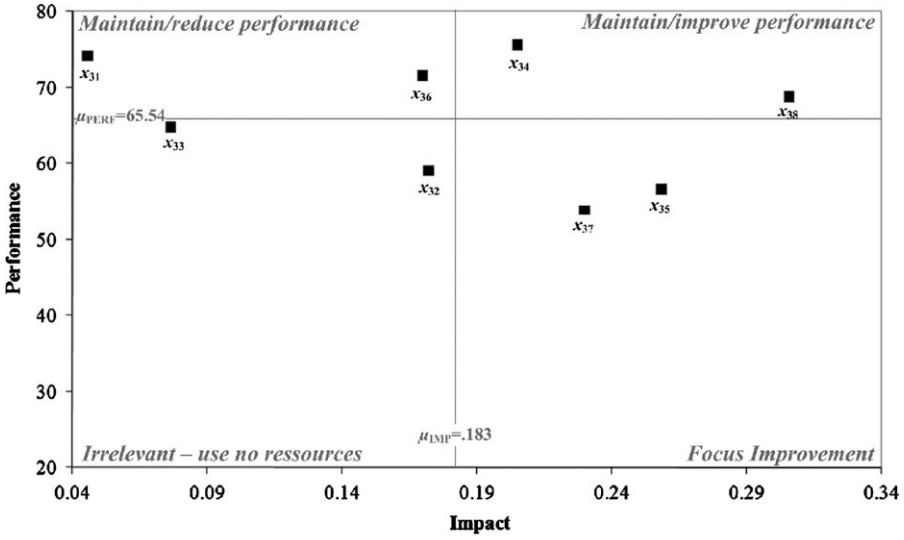


Fig. 3. Impact-performance matrix of all antecedents of SCM execution.



Caption: x_{31}, Processing orders according to agreement with customers; x_{32}, Forecasting future customer demand; x_{33}, Adapting production capacity according to customer demand; x_{34}, Informing customers about the current status of their orders; x_{35}, Integrating key accounts and suppliers into the product development process; x_{36}, Capability to manage returns and returned packaging; x_{37}, Integrating key accounts in the development/implementation of marketing programs; x_{38}, Building up multiple cooperation with important, strategic suppliers;

Fig. 4. Impact-performance matrix of the factor (adoption of) SCM-related processes (ξ_3).

comparable low PI but a high impact on the SCM execution in general. The joint SCM conditions show a comparable low level of performance level and impact and hence should not be of primary concern for the managers of respondent organizations. Finally, the adoption of SCM-related processes is on the highest performance level relative to the other antecedents of SCM execution. Due to its low impact the performance level should be maintained but not primarily focused. Having established an overview of the impact and performance of each influencing factors we turn our attention to what items should be prioritized within each factor.

The decision makers of our organizations shall investigate possibilities for changing the level of external integration of business processes with their suppliers and customers. We see that the overall performance of the adoption of SCM-related processes can be primarily achieved by 'integrating key accounts and suppliers into the product development process' (x_{35}) and the development/implementation of marketing programs (x_{37}) (see Fig. 4). Although showing a high performance level the 'processing orders according to agreement with customers' (x_{31}) and 'adapting production capacity according to customer demand' (x_{33}) have a comparably low importance for the overall factor.

Regarding the joint SCM conditions we see that the sample organizations have satisfactorily established long-term relationships within their supply chains with partners where mutual dependencies exist. When improving the performance level of the joint SCM conditions more joint project groups need to be developed (x_{23}) and more information on inventory status need to be exchanged (x_{210}) (see Fig. 5). The 'even distribution of power' (x_{27}) and 'even distribution of risks and benefits' (x_{28}) do not play a major role since these items show neither a high performance nor a high impact.

Finally, we focus on the most important factor that provides the highest potential to change the level of SCM execution. Fig. 6 clearly indicates that all items except x_{110} ('expertise for setting up supply chain relationships') and the 'importance of cross-functional execution of internal business processes' (x_{112}) have almost the same

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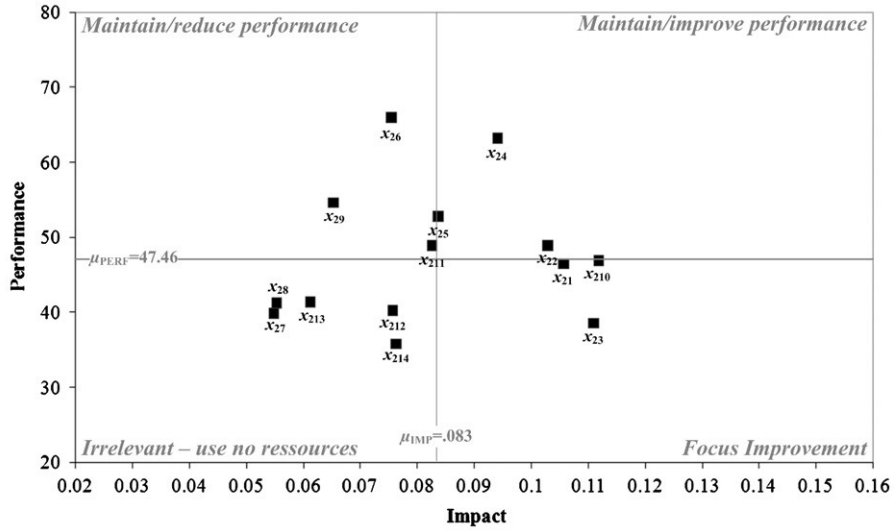
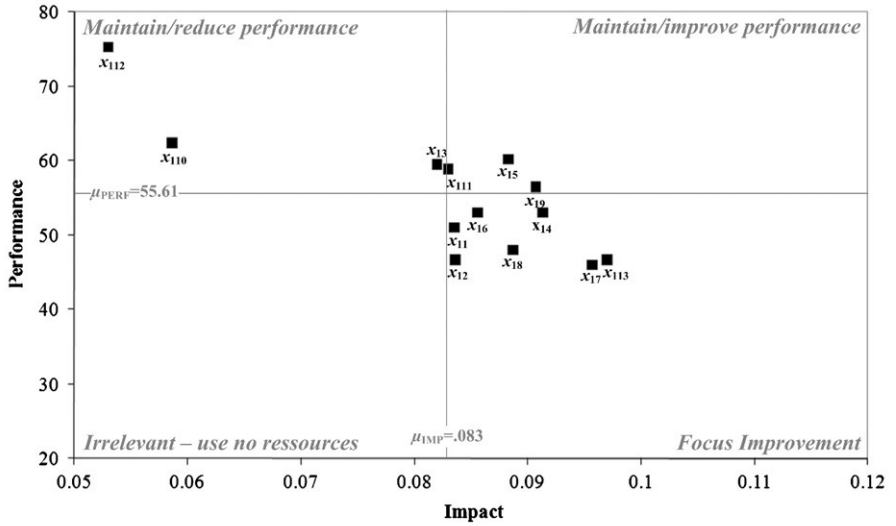


Caption: x_{21}, Collaborative evaluation of SC processes; x_{22}, Agreement on collaborative goals; x_{23}, Existence of joint project groups; x_{24}, Awareness of interdependency of decisions within the SC; x_{25}, Willingness to trust; x_{26}, Existence of long term relationships within the SC; x_{27}, Even distribution of power; x_{28}, Even distribution of risks and benefits; x_{29}, Existence of mutual dependencies; x_{210}, Exchange of information on inventory status; x_{211}, Exchange of information on forecasts; x_{212}, Exchange of information on product development; x_{213}, Similarities between corporate cultures; x_{214}, Similarities between corporate decision making styles;

Fig. 5. Impact-performance matrix of the factor joint SCM conditions (ξ_2).



Caption: x_{11}, Availability of human resources for SCM; x_{12}, Availability of financial resources for SCM; x_{13}, Top management support for SCM; x_{14}, Establishment of internal SCM objectives; x_{15}, Staff's expertise to use IT-systems for SCM; x_{16}, Capability of IT systems to process data from other SC members; x_{17}, Guidelines for information exchange; x_{18}, Trained staff for SCM projects; x_{19}, Cross functional/internal project groups; x_{110}, Expertise for setting up supply chain relationships; x_{111}, Willingness to integrate with other SC members; x_{112}, Importance of cross-functional execution of internal business processes; x_{113}, Internal evaluation of SC processes

Fig. 6. Impact-performance matrix of the factor internal SCM conditions (ξ_1).

potential to improve the overall PI of this factor. Nevertheless, the 'guidelines for information exchange' (x_{17}) and 'internal evaluation of supply chain processes' (x_{113}) should be of primary concern for supply chain managers in the evaluated organizations since they both show the lowest performance and the highest impact on this factor.

6. Conclusions and outlook

The execution of SCM follows a hierarchical order where internal SCM conditions affect joint SCM conditions that influence SCM-related processes. These collaborative business processes can be identified as the core antecedents that directly drive the execution of SCM. Internal and joint organizational conditions do not have the power to affect the execution of SCM directly. These findings support partly the conclusions from Boddy et al. (2000) and Mason and Leek (2008). However, the notions of Mentzer et al. (2001) or Lambert (2004) can be confirmed with respect to the importance of setting up the internal organizational conditions first, before entering into a supply chain partnership.

Our results also demonstrate a rather low performance level of SCM within the analyzed organizations. In order to improve the

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level of SCM execution, the importance-performance analysis revealed that decision makers shall focus on internal SCM conditions as these have been proven to have the total impact on the execution of SCM and thus can be seen as the first order antecedent of SCM followed by joint organizational conditions.

When looking at the internal SCM conditions resource-oriented items are shown to be important. They account for providing human and financial resources as well as adequate IT-systems and are able to master SCM-relationships and data exchange. The provision of proper information exchange guidelines and the establishment of internal SCM objectives are also crucial when trying to enhance the total level of SCM execution internally. Despite those improvement areas, it seems as if the fundament for SCM within the sample organizations is there since the expertise for setting up supply chain partnerships and the importance of cross-functional execution of business processes indicate a satisfactory performance level.

Limitations of our study refer to country- and industry-specific conditions that may reduce the external validity and the transferability of our results to other markets or supply chain settings. The survey results reflect the views of large organizations in the investigated market since SCM execution is more of an issue for such supply chain partners, and can, therefore, be investigated accordingly. Further research needs to extend the view towards smaller players and test the model with respect to their role in supply chain partnerships.

The findings reflect an aggregated view comprising the responses from a diverse kind of supply chain partners. This neglects, for example, the heterogeneity of responses from sets of informants representing different groups of supply chain partners. As a next step, moderators can be considered which influence the effects. Such moderators account for the affiliation to particular supply chain stages and industries, or to the size of supply chain partners.

Despite our model being grounded in theory and literature the endogenous factors are explained to a certain degree only (see r^2-values in Fig. 1). This calls for an extension of the model regarding other influencing factors. Such factors should reflecting soft dimensions of supply chain partnerships such as trust or power and environmental factors, e.g. the competitive structure the company is embedded in or the customer groups the companies target.

Finally, the model and the enclosed importance performance analysis can be used as a roadmap for further research. The antecedent factors and drivers can be explored more by using qualitative research methods and/or case studies. This would provide more in depth insight into what actually drives the execution SCM in organizations.

Table A1

Factor item ("To what degree…")		PI_{x_n}	λ_{x_n}	PI_{ξ_m,η_m}
Internal SCM conditions (ξ_1) (Kotzab et al., 2006b; Cigolini et al., 2004; Mentzer et al., 2001; Lambert et al., 1998; Cooper et al., 1997)				
x_{11}	…are personnel/human resources made available for SCM issues?	50.96	.08	54.18
x_{12}	…are financial resources made available for SCM issues?	46.69	.08	
x_{13}	…does top-management of your company support SCM issues?	59.69	.08	
x_{14}	…were internal goals set up before SCM projects were launched?	53.15	.09	
x_{15}	…are employees able to use IT-systems for SCM issues?	60.04	.09	
x_{16}	…does your company have IT-systems capable of processing data from other SCM partners?	53.00	.09	
x_{17}	…is there an agreement on guidelines with respect to the exchange of information with other companies in the supply chain?	45.77	.10	
x_{18}	…are employees trained in order to contribute to SCM-projects?	48.03	.09	
x_{19}	…does your company have project groups consisting of people from different functional areas?	56.56	.09	
x_{110}	…is there the necessary expertise in your company to set up and maintain supply chain relationships?	62.37	.06	
x_{111}	…your company is willing to integrate with other supply chain members?	59.04	.08	
x_{112}	…are personnel/human resources made available for SCM issues?	75.23	.05	
x_{113}	…are financial resources made available for SCM issues?	46.64	.10	
Joint SCM conditions (ξ_2) (Cigolini et al., 2004; Wisner, 2003; Ho et al., 2002; Fawcett and Magnan, 2001; Lambert et al., 1998)				
x_{21}	…is there collaborative agreement on the evaluation of supply chain processes with other supply chain members?	46.56	.11	47.70
x_{22}	…is there an agreement on collaborative goals with other supply chain members?	48.77	.10	
x_{23}	…are there supply chain project groups in place with other supply chain members?	38.79	.11	
x_{24}	…is your company aware that its decisions may affect other supply chain members?	63.10	.09	
x_{25}	…is your company willing to trust other supply chain members?	52.63	.08	
x_{26}	…does your company have long term relationships with other supply chain members?	65.69	.08	
x_{27}	…is there an equal distribution of power among all members in your supply chain?	39.71	.06	
x_{28}	…is the distribution of risks and benefits even between your company and other members in your supply chain?	41.17	.06	
x_{29}	…is there mutual dependency between your company and other members in your supply chain?	54.68	.07	
x_{210}	…does your company exchange information regarding stock levels with other supply chain members?	46.76	.11	
x_{211}	…does your company exchange forecasting information with other supply chain members?	48.99	.08	
x_{212}	…does your company exchange product development information with other supply chain members?	40.21	.08	
x_{213}	…is your corporate culture similar to other supply chain members?	41.33	.06	
x_{214}	…is your corporate decision-making similar to other supply chain members?	35.68	.08	
SCM-related processes (ξ_3) (Lambert et al., 1998)				
x_{31}	…is your company capable of processing orders according to agreement with customers in terms of quantities and times?	80.63	.05	64.62
x_{32}	…is your company capable of forecasting future customer demand?	59.13	.17	
x_{33}	…is your company capable of adapting production capacity according to customer demand?	64.69	.08	
x_{34}	…is your company capable of informing customers about the current status of their orders?	75.52	.21	
x_{35}	…is your company capable of intergrating key accounts and suppliers into the product development process?	56.76	.26	
x_{36}	…is your company capable of dealing with returns and returned packaging?	71.65	.17	
x_{37}	…is your company capable of intergrating key accounts in the development and implementation of marketing programs?	53.91	.23	
x_{38}	…is your company capable of building up multiple cooperations with important, strategic suppliers?	68.73	.31	
Execution of SCM (η_1) (Mentzer et al., 2001; Frohlich and Westbrook, 2001; Lambert et al., 1998)				
x_{41}	…has your company integrated sourcing, logistics, marketing, product development and other areas with your suppliers?	46.01	.39	48.08
x_{42}	…has your company integrated sourcing, logistics, marketing, product development and other areas with your customers?	43.28	.38	
x_{43}	…has your company internally integrated its sourcing, logistics, marketing, product development and other areas?	57.34	.28	

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Appendix

See Table A1 for more details.

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