EXPLORING THE NEXUS AMONG THE SUPPLY CHAIN INTEGRATION, SUPPLY CHAIN LEARNING AND THE INNOVATION PERFORMANCE OF AGRIBASED FIRMS IN INDONESIA

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Abstract: The prime objective of the current study is to examine the direct relationship between supply chain integration, supply chain learning, benchmarking and the innovation performance of the Agri. firms in Indonesia. In addition to that the study has examined the mediating role of the benchmarking in the relationship between supply chain integration and innovation performance and between supply chain learning and the innovation performance. The data is gathered from the operation and production managers of the Agri. based firms in the Indonesia. Using empirical data, the researcher may use research methods based on variance or covariance for estimation of structural equation models. The simultaneous estimation of the structural and measurement model is enabled through PLS method. The approach provides robust estimates for the data having multicollinearity and skewed distribution of data. Different managerial implications are provided by the results of this study. Initially, the learning of supply chain has found to mediate the relation of customer service performance and SCI as well as innovation performance and SCI for the weak firms. Generally, there is need for the managers to pay attention to the significance of travail and collective work by all the parties such as partners in supply chain and the focal firm.

Keywords: Supply chain, Learning, Innovation, Benchmarking, Agriculture

Introduction

The competition now occurs among the supply chains rather than the individual companies. The important role of SCI is a main theme for creation of value e.g. (Emmett & Crocker, 2016). According to recent research studies, generalized results were presented empirically on the relation of performance and SCI (Eben-Chaime, 2019). Different conclusions were made by these two meta-analytical studies regarding the SCI value proposition (Frischer, Pollak, & Jančíková, 2019). The use of different definitions, levels and operationalization leads to different findings for SCI (Gosling, Jia, Gong, & Brown, 2016). For understanding the

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relation of SCI with value creation and performance, the definition of operationalization has been presented along with level of SCI analysis in the section of Literature Review. Moreover, the researchers can be constraint by the role of mediators on the relation of SCI-performance to generalize the benefits of SCI (Masa'deh, Obeidat, & Tarhini, 2016; Petriková, & Trebuňa, 2017). Based on the perspective of RV and KBV, it has been argued that the management of inter-organization is done through mediating factors. The supply chain learning can be resulted through SCI (Masa'deh et al., 2016). This behavior of learning can cause undesired the competitors' imitative efforts. The powerful firms may differ in their results from the weaker firms (Chang, Ellinger, Kim, & Franke, 2016). Powerful firms can negotiate on the supply chain but the weaker firms have less power for negotiating supply chain. This is considered from the perspective of TCE (transition cost economics).

An inter-disciplinary research is required to investigate between inter-organizational learning and SCM (Zhu, Krikke, & Caniels, 2018). The perspective of KBV has been incorporated in this research while discussing RV. The role of inter-organizational learning on the relation of performance and firm has been investigated as a mediator. Moreover, the separate investigation on the weaker and powerful focal firms has added to the notion that firm's performance improves through SCI(Payne, Frow, & Eggert, 2017). The contributions have been made theoretically by considering the control power in the transaction opportunism.

Literature Review

A number of studies are present on the concept of SCI but it lacks clarity (Huo, Flynn, & Zhao, 2017). Different operationalization of the relation of Performance and SCI is because of different definitions. Further, it is linked with different analysis levels such as tactical, strategic, and operational (Autry et al., 2014). In order to explain the theoretical identities of various behaviors linked with integration, a continuum of interaction was summarized by Autry et al. (2014) from operational coordination to tactical cooperation. Operational coordination involves the planning support activities, integration of system and exchange of information. The strategic integration and collaboration includes the development and maintenance of collaborative associations(Zhu et al., 2018). The foundation of integration is based on tactical cooperation and operational coordination. The nature of integration analysis is strategic. The results are consistent with the firms' RV that suggest that strategic partnerships and inter firm integration can benefit the firms to gather resources, which are valuable (Ali, Mahfouz, & Arisha, 2017).

The importance of strategic collaboration is highlighted by the definition of SCI that stimulates the strategic information sharing, rewards, and risks on the value creation for customer to achieve competitive edge(Al Shobaki, Amuna, & Naser,

2017). The focus of SCI definition should be more on the integration locus rather than the integration substance. Rather than focusing on the supplier integration or customer integration, the focus of SCI should be on the integration with the key customers and key suppliers for developing the associations(Paustian-Underdahl, Halbesleben, Carlson, & Kacmar, 2016). SCI has been defined based on the definition of(Zhu et al., 2018). According to the researcher, the level with which the strategic collaboration is done by the firm with its partners in supply chain and inter-organizational processes are managed to give greater customer value, is referred as SCI. The innovation and development of products/service from the integration of customer and suppliers improve the performance of innovation. Therefore, the following hypothesis has been developed:

H1: Supply chain integration is in significant relationship with the innovation performance.

H2: Supply chain learning is in significant relationship with the innovation performance.

The rapid dissemination of public does not enable the firms to create, use, and duplicate knowledge altogether. The easily transferable knowledge can also be imitated (Ralston, Blackhurst, Cantor, & Crum, 2015). The learning of supply chain is supported by SCI with the important customers and suppliers. The processes and products can be imitated when the competitors share similar customers and suppliers. Benchmarking will benefit the competitors when the overall absorptive capability and ability of using, transforming, and utilizing knowledge of the focal firm is imitated (Kaliani Sundram, Chandran, & Awais Bhatti, 2016). In order to discourage the benchmarking by the rivals, there is need for continuous improvement to create diseconomies of time compression. Rivals will require time to develop expertise and familiarity with the allocation of resources (Panayides, 2017; Straka, 2010). By using several techniques and tools, incremental improvements are undergone by the innovations at the introduction time (Hangartner, Totura, Labouliere, Gryglewicz, & Karver, 2019). A process or product can be imitated by the competitors but the high pace of improving process and product cannot be kept up. When there is wide diffusion of knowledge with the important customers and suppliers, the benchmarking can be prevented from the rivals by the ability of the focal firm to enhance the process of production and products.

There can be threat of easy benchmarking while supporting the learning of supply chain. Therefore, the firm should put greater efforts to prevent such benchmarking threat. The performance consequences of rivalry in the industry have been emphasized by several studies. It was found by (Tidd & Bessant, 2018) that with the increase in rivalry in the software industry, the performance of focal firm decreases. Evidence was provided by (Tarafdar & Qrunfleh, 2017) for the similar idea through depiction of negative association between stock prices and the benchmarking of rivals. It was summarized by (Panayides, 2017) as Red Queen. It is referred as a phenomenon in which the performance of firm is based on the

match with the rivals' actions. In order to prevent benchmarking by rivals, continuous investment should be made by the focal firms in improving their processes and products. This further enhances the performance in terms of innovation. The following research hypothesis has been developed in this regard:

H3: Supply chain Integration is in significant relationship with the Benchmarking.

H4: Supply chain learning is in significant relationship with the Benchmarking.

H5: Benchmarking is in significant relationship with the innovation performance

H6: Benchmarking mediates the relationship between supply chain integration and innovation performance.

H7: Benchmarking mediates the relationship between Supply chain learning and innovation performance.

Research Methodology

The distinctive SCI categories have been focused. In the selected surveys, all the items have been closely examined for SCI research. The categorizing of these items was proposed as practice, attitude, and pattern based on the proposal of(Giannakis & Papadopoulos, 2016) . The items measuring the suppliers or buyers' attitude for each other of SCI in general are included in attitude category. The second category of practices is considered as technologies or tangible activities, which play a crucial role in the focal firm's collaboration with the customers and suppliers. The interaction patters of the customers/suppliers with the focal firm, which refer to the third category. The arguments of (Giannakis & Papadopoulos, 2016) have been used, which claim that the interactions patterns are not enough for depiction of a positive association between the performance and attitudinal aspects. Conceptually, it is logical to focus on the association between patterns and practices of supply and performance. The items, which cover the flow of information, decision, benefits of allocation and product/service, are selected for the measure of SCI patterns (Lim, Tseng, Tan, & Bui, 2017). The scale developed by (Lim et al., 2017) has been used in this research with reference to learning of supply chain. Diver difference processes have been covered by the measurement items, which focus on assurance of active learning management by the suppliers, managers, and customers. Two classical items for measurement of benchmarking prevention was provided by(Hangartner et al., 2019), which include innovation of products and manufacturing processes.

Results

Using empirical data, the researcher may use research methods based on variance or covariance for estimation of structural equation models. The AMOS and LISREL approaches are referred as covariance-based methods while PLS approach involves the use of variance-based partial least squares (PLS) method. For

selection of suitable method for SEM estimation, the use of PLS approach has been adopted for the study (Hair Jr, Hult, Ringle, & Sarstedt, 2016). The explanatory models can be analyzed effectively through use of PLS method, which are at the initial level of testing and theory development (Hair Jr et al., 2016). The simultaneous estimation of the structural and measurement model is enabled through PLS method. The approach provides robust estimates for the data having multicollinearity and skewed distribution of data. Moreover, it offers benefit in terms of using a sample size of sample as compared with the methods based on covariance. The sample size in this study is small, which makes the selection of PLS method effective. Smart PLS Version 2.0 M3 Beta has been used in this research. The item loadings and path coefficient significance has been estimated using approach of bootstrapping. A random sample of 500 observations with replacements was created through use of data set. For every parameter, the t-statistics were used.
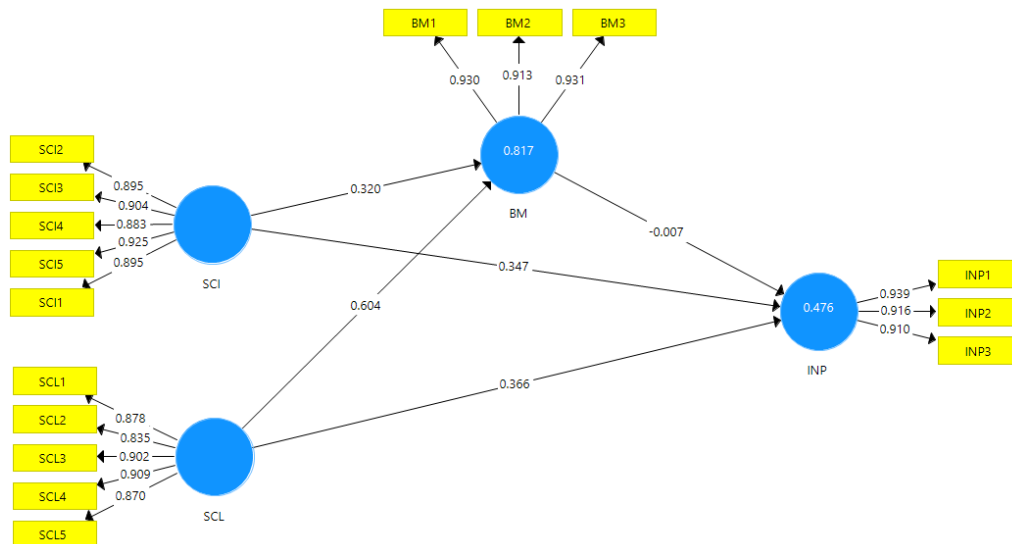

Figure 1. Measurement Model

For ensuring the suitability of the outer model, the reliability, uni-dimensionality of the model have been determined. The factor loadings and value of Cronbach's α have been used for testing the model's uni-dimensionality. The standard value of Cronbach's alpha must lie between 0.6-0.7. All the factors used in this study have value in this range as shown in Table 2. The value of factor loadings for all the variables is greater than the standard value 0.50. In this way, the uni-dimensionality of the model is ensured. The value of composite reliability for all the scales is greater than the standard 0.70. Table III shows the correlation of

variables. The value of AVE is greater than 0.50. The square root value of AVE of a variable is greater than correlation of variable with other constructs.

Table 1. Reliability

	Cronbach's Alpha	rho_A	CR	(AVE)
BM	0.915	0.918	0.946	0.855
INP	0.911	0.912	0.944	0.850
SCI	0.942	0.942	0.955	0.811
SCL	0.926	0.928	0.944	0.773

The suggestions of (Hair Jr et al., 2016) have been used for testing the effects of moderators as hypothesized in H1 and H2 as well as the direct association (H3). The predicting variables (learning of supply chain and SCI) were regressed against the variables acting as mediator including benchmarking prevention and learning of supply chain.
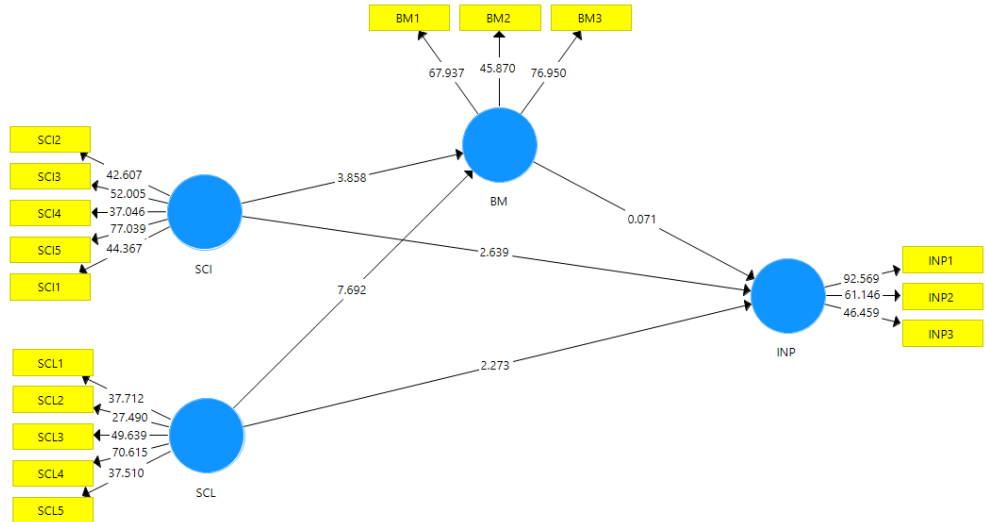

Figure 2. Structural Model

Table 2. Direct Relationships

	(O)	(M)	(STDEV)	(|O/STDEV|)	P Values
BM -> INP	-0.007	0.002	0.101	0.071	0.472
SCI -> BM	0.320	0.321	0.083	3.858	0.000

SCI -> INP	0.347	0.341	0.132	2.639	0.004
SCL -> BM	0.604	0.603	0.079	7.692	0.000
SCL -> INP	0.366	0.363	0.161	2.273	0.012

The regression was carried out for the dependent variable on the predicting and mediating variables. For verification of the mediation effect, all these effects need to be significant. By adding a mediating variable, the correlation between the outcome and predicting variable is reduced. Table 2 and 3 shows the results for the analysis of structural model. It has been found that learning of supply chain and INP are positively related with each other. The value of β ¼ is 0.34 at significance level 0.004. Moreover, the learning of supply chain is positively linked with the prevention of benchmarking as represented by the β 0.60 at 0.000 level of significance.

Table 3. Mediation

	(O)	(M)	(STDEV)	(|O/STDEV|)	P Values
SCI -> BM -> INP	0.322	0.231	0.034	4.066	0.000
SCL -> BM -> INP	0.534	0.323	0.061	3.070	0.000

Different managerial implications are provided by the results of this study. Initially, the learning of supply chain has found to mediate the relation of customer service performance and SCI as well as innovation performance and SCI for the weak firms. Generally, there is need for the managers to pay attention to the significance of travail and collective work by all the parties such as partners in supply chain and the focal firm. Further, managers should focus on training the parties, which establishes transparency and trust in the learning of supply chain (Huo et al., 2017; Oláh et al., 2017; Pakurár et al., 2019). Practically, the information controls should be identified and supported by the weak focal firms, which promotes the intensity in dialog and communication internally and with the important partners in supply chain. Alternatively, the overuse of power should be deterred by the strong focal firms. The pressure on the knowledge transfer of weak partners should be alleviated by them. For instance, the investments for establishing relation with the suppliers and developing membership team of supplier can be made (Paustian-Underdahl et al., 2016). The knowledge sharing can be willingly done by the weak partners, which benefit the performance of strong focal firms.

Conclusions

The study found that the relation between innovation performance and learning of supply chain is mediated through benchmarking prevention in all the models (H2). However, the mediating influence of benchmarking prevention is not much significant as compared with the role of supply chain learning as a mediator in the complete model (0.01 significance level). The results of study conducted by (Kock & Hadaya, 2018) can be used for explaining the findings. For instance, benchmarking is supported by the techniques that facilitate learning of supply chain. The focal firms, which are powerful, are advanced in their research capabilities and knowledge harvesting experience less time for improvements in innovation performance (Kaliani Sundram et al., 2016). There is positive relation of SCI to performance of customer service and innovation which is consistent with hypotheses H3a and H3b respectively. By higher value creation for the customers, SCI can provide differentiation. The influence created on weak focal firms by the powerful focal firms has been analyzed separately. It has been found that more benefits are achieved by the powerful focal firms from SCI as compared with the weaker ones.

In order to respond the need for a research on exploring the relation between inter-organizational learning and SCM, the role of inter-organizational learning as a mediator has been discussed in this study for the relation of performance and SCI (Chang et al., 2016). The perspective of RV is involved in the SCI definition used in this research. The RV view suggests that resources, which are scarce, valuable, and complementary, can be combined with partners in supply chain to generate relational rent. In order to generate and achieve the relational rent, it is recommended to exchange knowledge and learning among the firms (Payne et al., 2017). This has been verified empirically in this research. The learning processes in supply chain are consistent with the three processes of benchmarking. These processes include the transfer of knowledge, its application, and transformation. The generation of knowledge is done within the firm while the exploratory learning is done across the borders.

This study suggested to the policymakers that they should develop the policies regarding the supply chain that improve the performance of the supply chain within the organization. This study also have some limitation and future direction for the further studies. This study used only two factors to predict the innovation performance and further studies may include other factors to predict the innovation performance. In addition, this study used the mediation in the model and future studies may add moderator in their studies.

References

Al Shobaki, M. J., Amuna, Y. M. A., & Naser, S. S. A. (2017). Strategic and Operational Planning As Approach for Crises Management Field Study on UNRWA.

Ali, A., Mahfouz, A., & Arisha, A. (2017). Analysing supply chain resilience: integrating the constructs in a concept mapping framework via a systematic literature review. *Supply Chain Management: An International Journal, 22*(1), 16-39.

Chang, W., Ellinger, A. E., Kim, K. K., & Franke, G. R. (2016). Supply chain integration and firm financial performance: A meta-analysis of positional advantage mediation and moderating factors. *European Management Journal, 34*(3), 282-295.

Eben-Chaime, M. (2019). The overlooked dependencies of material flows on quality and quality assurance. *Acta logistica, 6*(3), 85-91.

Emmett, S., & Crocker, B. (2016). *The relationship-driven supply chain: creating a culture of collaboration throughout the chain*: Routledge.

Frischer, R., Pollak, M., & Jančíková, Z. K. (2019). Optimizing logistics routes in the field of maintenance. *Acta logistica, 6*(3), 93-101.

Giannakis, M., & Papadopoulos, T. (2016). Supply chain sustainability: A risk management approach. *International Journal of Production Economics, 171*, 455-470.

Gosling, J., Jia, F., Gong, Y., & Brown, S. (2016). The role of supply chain leadership in the learning of sustainable practice: toward an integrated framework. *Journal of Cleaner Production, 137*, 1458-1469.

Hair Jr, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A primer on partial least squares structural equation modeling (PLS-SEM)*: Sage publications.

Hangartner, R. B., Totura, C. M. W., Labouliere, C. D., Gryglewicz, K., & Karver, M. S. (2019). Benchmarking the "Question, Persuade, Refer" program against evaluations of established suicide prevention gatekeeper trainings. *Suicide and Life-Threatening Behavior, 49*(2), 353-370.

Huo, B., Flynn, B. B., & Zhao, X. (2017). Supply chain power configurations and their relationship with performance. *Journal of Supply Chain Management, 53*(2), 88-111.

Kaliani Sundram, V. P., Chandran, V., & Awais Bhatti, M. (2016). Supply chain practices and performance: the indirect effects of supply chain integration. *Benchmarking: An International Journal, 23*(6), 1445-1471.

Kock, N., & Hadaya, P. (2018). Minimum sample size estimation in PLS-SEM: The inverse square root and gamma-exponential methods. *Information Systems Journal, 28*(1), 227-261.

Lim, M. K., Tseng, M.-L., Tan, K. H., & Bui, T. D. (2017). Knowledge management in sustainable supply chain management: Improving performance through an interpretive structural modelling approach. *Journal of Cleaner Production, 162*, 806-816.

Masa'deh, R. e., Obeidat, B. Y., & Tarhini, A. (2016). A Jordanian empirical study of the associations among transformational leadership, transactional leadership, knowledge sharing, job performance, and firm performance: A structural equation modelling approach. *Journal of Management Development, 35*(5), 681-705.

Oláh, J., Karmazin, Gy., Fekete Farkasné, M., & Popp, J. (2017). An examination of trust as a strategical factor of success in logistical firms. *Business Theory and Practise*, 18(1), 171-177.

Pakurár, M., Benedek, S.A., Popp, J., Magda, R., & Oláh, J. (2019). Trust or Doubt: Accuracy of Determining Factors for Supply Chain Performance. *Polish Journal of Management Studies*, 19(1), 283-298

Panayides, P. M. (2017). Global supply chain integration and competitiveness of port terminals *Ports, cities, and global supply chains* (pp. 43-56): Routledge.

Paustian-Underdahl, S. C., Halbesleben, J. R., Carlson, D. S., & Kacmar, K. M. (2016). The work–family interface and promotability: Boundary integration as a double-edged sword. *Journal of Management, 42*(4), 960-981.

Payne, A., Frow, P., & Eggert, A. (2017). The customer value proposition: evolution, development, and application in marketing. *Journal of the Academy of Marketing Science, 45*(4), 467-489.

Petriková, A., & Trebuňa, P. (2017). Application of selected logistic methods in the area of supply logistics. *Acta Montanistica Slovaca*, 22(3), 323-334.

Ralston, P. M., Blackhurst, J., Cantor, D. E., & Crum, M. R. (2015). A structure–conduct–performance perspective of how strategic supply chain integration affects firm performance. *Journal of Supply Chain Management, 51*(2), 47-64.

Straka, M. (2010). Alfa, as distribution logistics system. *Acta Montanistica Slovaca*, 15, 34-43.

Tarafdar, M., & Qrunfleh, S. (2017). Agile supply chain strategy and supply chain performance: complementary roles of supply chain practices and information systems capability for agility. *International Journal of Production Research, 55*(4), 925-938.

Tidd, J., & Bessant, J. R. (2018). *Managing innovation: integrating technological, market and organizational change*: John Wiley & Sons.

Zhu, Q., Krikke, H., & Caniels, M. C. (2018). Supply chain integration: value creation through managing inter-organizational learning. *International Journal of Operations & Production Management, 38*(1), 211-229.

WYKORZYSTANIE NEXUSA W RAMACH INTEGRACJI ŁAŃCUCHA DOSTAW, NAUKI ŁAŃCUCHA DOSTAW I WYDAJNOŚCI INNOWACYJNYCH AGRIBASOWANYCH FIRM W INDONEZJI

Streszczenie: Artykuł przedstawia badanie bezpośredniego związku między integracją łańcucha dostaw, uczeniem się łańcucha dostaw, analizą porównawczą i wynikami Agri w zakresie innowacji. firm w Indonezji. Ponadto w badaniu zbadano mediacyjną rolę analizy porównawczej w powiązaniu między integracją łańcucha dostaw a wydajnością innowacji oraz między uczeniem się łańcucha dostaw a wydajnością innowacji. Dane były gromadzone od kierowników operacji i produkcji Agri. firmy z siedzibą w Indonezji. Korzystając z danych empirycznych, można zastosować metody badawcze oparte na wariancji lub kowariancji do oszacowania modeli równań strukturalnych. Jednoczesne oszacowanie modelu konstrukcyjnego i pomiarowego jest możliwe za pomocą metody PLS. Podejście to zapewnia wiarygodne szacunki dla danych o wielokoliniowości i przekrzywionej dystrybucji danych. Wyniki tego badania zapewniają różne implikacje zarządcze. Początkowo nauka łańcucha dostaw mogła pośredniczyć w relacji wydajności obsługi klienta i SCI, a także wydajności innowacji i SCI dla słabych firm. Zasadniczo menedżerowie muszą zwracać uwagę na znaczenie pracy i pracy zbiorowej przez wszystkie strony, takie jak partnerzy w łańcuchu dostaw oraz główna firma.

Słowa kluczowe: łańcuch dostaw, nauka, innowacje, analiza porównawcza, rolnictwo

探索印度尼西亚的供应链整合，供应链学习和农业企业的创新绩效

摘要：当前研究的主要目的是研究供应链整合，供应链学习，基准测试和农业创新绩效之间的直接关系。印度尼西亚的公司。此外，该研究还研究了基准测试在供应链整合与创新绩效之间以及供应链学习与创新绩效之间关系中的中介作用。数据是从Agri的运营和生产经理那里收集的。印度尼西亚的公司。利用经验数据，研究人员可以使用基于方差或协方差的研究方法来估计结构方程模型。通过PLS方法可以同时估计结构模型和测量模型。该方法为具有多重共线性和偏斜分布的数据提供了可靠的估计。这项研究的结果提供了不同的管理含义。最初，对供应链的学习发现可以调解弱企业的客户服务绩效和SCI以及创新绩效和SCI之间的关系。通常，管理者需要注意所有各方(例如供应链中的合作伙伴和焦点公司)的辛苦工作和集体工作的重要性

关键字：供应链，学习，创新，对标，农业