INFLUENTIAL FACTORS ON SUPPLY CHAIN COLLABORATION IN VIETNAM'S WOOD PROCESSING INDUSTRY

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This paper focuses on the examination of influential factors on supply chain collaboration of Vietnamese enterprises in the wood processing industry. The factors to be analyzed include trust, power, frequency, maturity, distance, policy and attitude. The research data is obtained by sorting out 275 questionnaires from directors/ directors general of wood processing enterprises in HCMC, Đồng Nai and Bình Dương Provinces. The result shows that five factors have considerable effects on supply chain collaboration of enterprises, namely trust, power, frequency, maturity, and attitude. This research thereby presents the management implications in relation to these factors.

Keywords: supply chain collaboration, wood processing enterprise, attitude.

1. Introduction

Wood production has yielded billions of USD for Vietnam, and Vietnamese wooden products have been present in 156 countries and territories. However, wood production and distribution are still spontaneous, show a lack of connection between participants, and fail to fulfill the requirement for sustainable development due to subjective and objective reasons. If enterprises wish to maintain their status, enhance their competitiveness and expand their market shares, they need to set an effective business pattern, that is, to establish a suitable collaborative supply chain. Therefore, this research aims at discovering influential factors in supply chain collaboration and determining their influence levels to gain benefits for enterprises such as increased revenues, decreased costs, and higher flexibility to cope with uncertain rising demands.

Many researchers worldwide have examined influential factors on supply chain collaboration. Specifically, Christopher (1998) and Sahay (2003) refer to the benefits of supply chain interaction, or Jenny Backtrand (2007) think that there are four factors affecting the levels of supply chain relations, namely trust, power, maturity and trading frequency. This research aims to determine influential factors on supply chain collaboration and employ a quantitative model to find out which factors influence the co-operation of participants in the chain. It hopefully contributes to supply chain collaboration in both theory and practice so that wood processing enterprises can exist and develop sustainably in the context of fierce competitiveness at global level.

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2. Theoretical basis and hypotheses

The research will identify influential factors on supply chain collaboration in the wood processing industry by looking into the following seven factors:

a. Trust between partners:

Trust is the reflection of the faith placed on a partner and relates to the weaknesses and uncertainty on a certain aspect of the trusted partner (Joyce K. Y. Chan & Mattew K. O. Lee, 2002). According to McAllister D. (1995), trust is connected with cognition and is based on influential forms. Robert B. Handfield and Christian Bechtel (2001) add that tangible assets can play an important role in nurturing trust between partners in an intermediary relationship. As for Corbett et al. (1999), they think that a successful relationship is characterized by mutual trust and that enterprises with mutual trust always make profits, serve their customers better and adapt more easily to changes. In the author's viewpoint (2011), there is another factor in Vietnam needed for partners in supply chain to trust each other, namely the prestige of each partner. It can be demonstrated through their brand names and their manners of making payment, and signing and executing contracts. Once an organization "sees" the aforementioned qualities in potential partners, it can put its trust in such partners and feel ready to cooperate with them. Thus, the hypothesis is as follows:

H1: The higher the trust between supply chain members is, the closer and more effective their collaboration is (H1 is positive).

b. Power of partners:

If a partner dominates the others in terms of size, influences and status, they gain more powers. When one partner is more powerful, it can create pressure on others to gain favorable decisions (Jenny Backstrand, 2007). According to Joyce K. Y. Chan and Mattew K. O. Lee (2002), power is regarded the core of all business relations. With power, enterprises can control, allow, or exert their influences on the action of an individual or another enterprise as a command.

The author (2011) thinks that the *power* factor is achieved subjectively and objectively. Subjectively-achieved power comes from the origin, financial sources and human resources owned by the enterprise itself. A enterprise is usually considered ~~as~~ powerful when it possesses abundant financial sources, and high-quality and technologically-skilled human resources. Objectively-achieved power is determined by the ownership state of an enterprise, that is whether or not they are protected by the government and have a monopoly of supply and purchase. The higher these factors are, the greater objectively-achieved power an enterprise can gain, and vice versa. Thus, the hypothesis is as follows:

H2: The greater the power between supply chain members is, the closer and more effective their collaboration is (H2 is positive).

c. Maturity of relationship between partners:

Increased interaction levels in supply chain lead to a decrease in uncertainty in the forecast of demand and supply as well as an improvement in business performance of enterprises. This is the best way to pursue and gain competitive advantages. Maturity in supply chain relationship can be characterized by the ability to predict, the power to control, validity and effectiveness (Childerhouse et al., 2003). Thus, the hypothesis is as follows:

H3: The more maturity the transactions between supply chain members gain, the closer and more effective their collaboration is (H3 is positive).

d. Trading frequency and volume between partners:

Frequency is the regularity level related to how often a transaction is usually done (Ellarm, 1991). No general rule can determine how often partners should interact, but there is a portfolio matrix comprised of four relevant items, namely strategy, outsourcing, connection for production and convenient relations. The more transactions are done, the more interaction is produced. This

therefore establishes closer relationships and guarantee the smooth running of the transaction (Cooper et al., 1997). Thus, the hypothesis is as follows:

H4: The higher the transaction frequency between supply chain members is, the closer and more effective their collaboration is (H4 is positive).

e. Distance between partners:

This research refers to geographical distance between partners. Usually, the nearer they are, the more they tend to exchange transaction due to time and delivery cost savings. However, in the globalization setting, geographical distance is losing its significance because the world is flattening (Thomas L. Friedman, 2006) and enterprises tend to make judgment on business performance instead of distance. However, in a transitional and newly open economy like Vietnam, the feasibility of doing transactions with domestic or foreign partners should be carefully considered. Thus, the hypothesis is as follows:

H5: The shorter the geographical distance between supply chain members is, the closer and more effective their collaboration is (H5 is positive).

f. Business policies between partners:

Business policies can create favorable conditions for partners and vice versa. An open policy can stimulate and facilitate transactions and vice versa. Policies may be introduced by governments, such as tariff and non-tariff policies, and by enterprises in the supply chain, such as policies on technological and technical requirements, etc. (John T. Menzer, 2001). Altogether, introduction of a policy can make particular impacts on the possibility of cooperation between partners in supply chain. Thus, the hypothesis is as follows:

H6: Favorable policies of supply chain members can boost their collaboration and vice versa (H6 is positive).

g. Attitude between partners including suppliers/producers, producers/consumers, suppliers/suppliers, producers/producers:

Enterprises link up only when they can see the benefits that they expect to gain in the future (Robert B. Handfield & Christian Bechtel, 2001). In fact, they should spend much time on pointing out the potential benefits from cooperation and building positive attitude toward working together. Members in supply chain must establish relationships at high levels and frequently consolidate them (John T. Menzer, 2001). Based on these viewpoints, attitude or cooperative culture in general is still a vague category in Vietnam. According to the author, this factor is very important to supply chain collaboration. Thus, the hypothesis is as follows:

H7: The more positive the transacting attitude of supply chain members, the more effective their collaboration is (H7 is positive).

With the above-mentioned hypotheses, the research model is presented in Figure 1:

3. Methodology

a. Size of sample:

The sample in this research is selected in HCMC, Đồng Nai and Bình Dương Provinces based on specified industry, size, operation time, the guarantee to represent manufacturers in buying materials and selling products, etc. Data is gathered from a sample of 300 wood processing enterprises in the three provinces.

b. Process:

- Preliminary research:

Two stages, qualitative and quantitative, are carried out. The qualitative stage aims to identify influential factors in supply chain collaboration as well as members' satisfaction, and to adjust scales. The quantitative stage is conducted through discussion with 10 managers from wood processing enterprises to find out about the concepts and operation characteristics of the surveyed enterprises, build draft scales, and a discussion plan carried out from January to March 2011. Next, a survey is done on 50 enterprises by convenient sampling to detect questionnaire errors and initially test the scales. The preliminary research has built a questionnaire used for the final research,

reducing the number of observed variables from 56 to 35.

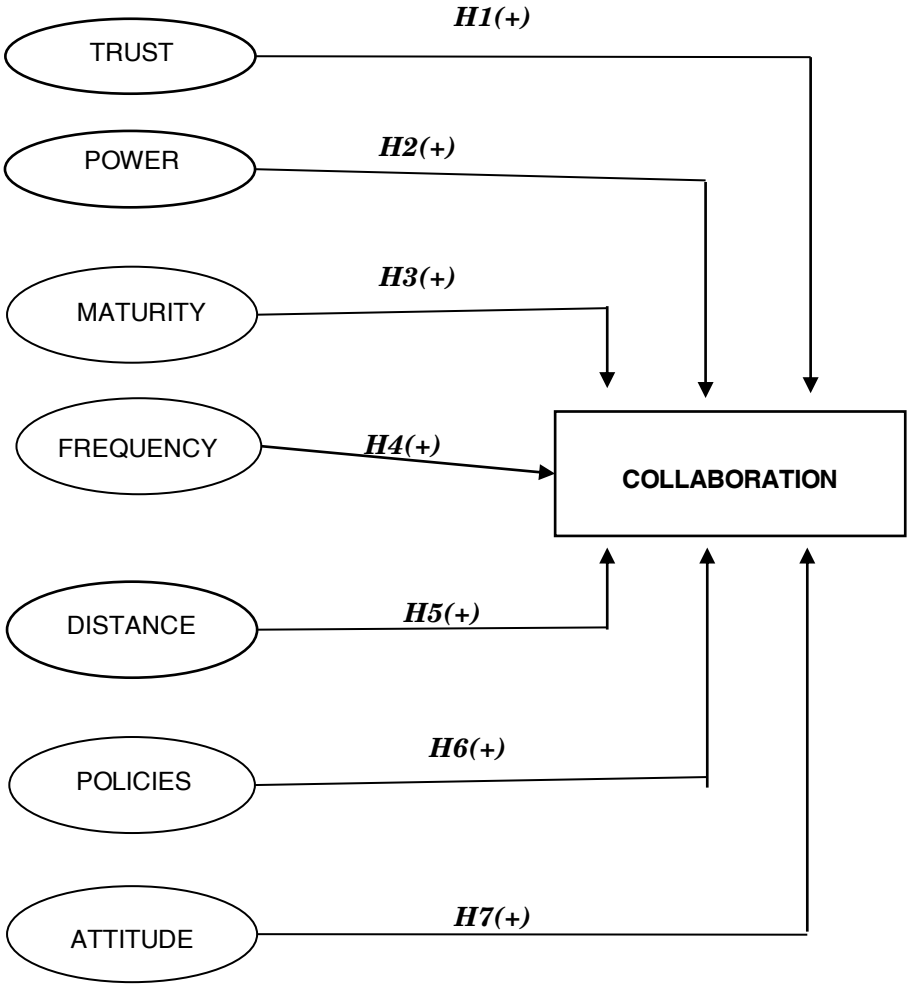

Figure 1: Hypothetical research model

- Final research:

The final research is carried out using the quantitative method after the questionnaire is modified from the preliminary research results. It directly surveys managers of sales, purchase, planning, and coordinating divisions, or directors and directors general to collect data from March to May 2011. The concepts in research are measured on scales with numerous observed variables. The Likert seven-level scale that ranges from (1) absolute disagreement to (7) absolute agreement is selected. The values of the scale are calculated by averaging observed variables representing the concepts. Gathered questionnaires are employed to assess the scale and test the hypotheses. Data are processed with the SPSS software, version 16.0.

4. Data analysis

a. Description of sample:

The sample consists of 300 fully domestic-invested wood enterprises with 30% of them being state-owned, 45% private limited companies and the remaining 25% private enterprises. Regarding sizes, large enterprises account for 20%, and small and medium ones 80%. There were 290 enterprises that responded, but only 275 answers were appropriate for analysis, including 79 state-owned enterprises (making up 28.73%), 126 private enterprises (45.82%) and 70 joint-stock enterprises (25.45%). Most of the respondents are small and medium enterprises.

b. Scale assessment and factor analysis:

The Cronbach's alpha coefficient with a value of 0.6 and above is used to test the reliability of each component on the scale of supply chain collaboration in the wood industry. The result shows that all concepts have a satisfactory alpha value, except for the *distance* concept (DIS) with alpha = 0.354 <0,5, therefore excluded from the EFA.

The factor DIS consists of five observed variables. Its reliability is tested before it is put into EFA. The result is as follows:

+ First time: with Cronbach's Alpha = 0.354 < 0.5, all of the five observed variables (dis1, dis2, dis3, dis4, and dis5) are much smaller than 0.5.

+ The following steps: with the observed variables being removed one by one, Alpha remains lesser than 0.5. This proves that DIS is unreliable

Table 1: Scale test with coefficient of reliability (Cronbach's alpha)

Observed variable	Scale mean if variable to be deleted	Scale variance if variable to be deleted	Item-total correlation	Alpha value if variable to be deleted
Trust scale (TRU) (Alpha = 0.856)				
TRU_1	29.08	43.049	0.516	0.850
TRU_2	29.46	40.746	0.584	0.842
TRU_3	29.04	38.882	0.743	0.818
TRU_4	28.39	43.902	0.529	0.848
TRU_5	28.83	40.349	0.676	0.828
TRU_6	28.51	40.047	0.661	0.830
TRU_7	29.23	38.615	0.643	0.833
Power scale (POW) (Alpha= 0.747)				
POW_1	12.42	14.493	0.601	0.660
POW_2	12.96	14.345	0.582	0.668
POW_3	12.17	13.524	0.492	0.724
POW_4	12.39	14.413	0.511	0.706
Maturity scale (MAT) (Alpha= 0.838)				
MAT_1	0.660	15.659	0.700	0.781
MAT_2	0.668	16.448	0.723	0.772
MAT_3	0.724	17.785	0.587	0.830
MAT_4	0.706	16.748	0.673	0.793
Frequency scale (FRE) (Alpha= 0.829)				
FRE_1	15.39	12.188	0.697	0.766
FRE_2	15.55	12.898	0.644	0.791
FRE_3	15.51	11.601	0.744	0.743
FRE_4	15.92	12.658	0.553	0.834
Distance scale (DIS) (Alpha = 0.354)				
DIS_1	18.55	12.365	0.251	0.230
DIS_2	18.05	11.596	0.264	0.212
DIS_3	17.24	15.754	0.099	0.360
DIS_4	17.43	15.093	0.177	0.304
DIS_5	18.76	16.198	0.074	0.376
Policy scale (POL) (Alpha= 0.846)				
POL_1	14.71	19.800	0.775	0.766
POL_2	14.19	18.798	0.791	0.756
POL_3	14.20	19.396	0.761	0.770
POL_4	15.47	22.666	0.444	0.907
Attitude scale (ATT) (Alpha = 0.806)				
ATT_1	14.25	15.313	0.627	0.755
ATT_2	14.41	14.959	0.676	0.732
ATT_3	14.23	13.978	0.675	0.730
ATT_4	14.05	15.731	0.518	0.807
Collaboration scale (COL) (Alpha = 0.795)				
COL_1	8.33	9.675	0.669	0.695
COL_2	8.63	8.598	0.624	0.741
COL_3	8.29	9.220	0.630	0.729

because in practice, geographical distance does not very much affect the cooperation between supply chain partners. Enterprises care about effective cooperation, rather than a convenient, but unsustainable and unproductive, cooperation. Hence, this factor is omitted from EFA. It is also because it is an experimental factor in the model.

frequency, maturity, policy and attitude with supply chain collaboration.

Put the six factors into the regression analysis with the Enter method; at a significance level of smaller than 0.05, and check for multicollinearity between the variables. The next regression result is as follows:

Table 2: EFA result in a six-factor model

Concept	Component	Number of observed variables	Reliability (Alpha)	(%) Variance extracted	Evaluation
Collaboration (COL)	Trust (TRU)	7	0.856	69.689	Satisfactory
	Power (POW)	4	0.747		
	Frequency (FRE)	4	0.829		
	Maturity (MAT)	4	0.838		
	Policy (POL)	5	0.846		
	Attitude (ATT)	4	0.806		
Benefits of supply chain collaboration		3	0.833		

Table 3: Multi-regression result in a five-factor model

Model		Unstandardized coefficient		Standardized coefficient	t	Sig.	Multicollinear statistics	
		Beta	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-1.283E-16	0.044		0.000	1.000		
	TRU	0.285	0.044	0.285	6.427	0.000	1.000	1.000
	MAT	0.352	0.044	0.352	7.938	0.000	1.000	1.000
	POW	0.428	0.044	0.428	9.658	0.000	1.000	1.000
	FRE	0.243	0.044	0.243	5.497	0.000	1.000	1.000
	ATT	0.161	0.044	0.161	3.626	0.000	1.000	1.000

The result of EFA with six factors for the first time produces KMO = 0.847 and six factors are extracted as determined earlier with a factor loading coefficient greater than 0.5 and a tiny significance level of 0.000. This proves that the model employed in EFA is appropriate. However, some observed variables such as FRE_4 are invalid: it is distributed into two factors, but difference in factor loading coefficients between them is smaller than 0.3, therefore they are omitted. The second-time EFA shows that KMO is equal to 0.833 at a significance level of under 0.05 and also allows extraction of six factors.

c. Regression analysis and hypothesis test:

The Pearson's correlation coefficient is employed to analyze the correlation between trust, power,

The factor POL is eliminated from the regression model as having sig = 0.269 > 0.05. The other five factors are suitable at a very low significance level of 0.000, and no multicollinearity is found. According to the regression result, the adjusted R^2 is 0.463, which is acceptable to this new research issue in Vietnam. This indicates that 46.3% of changes in supply chain collaboration is explained by such variables as TRU, POW, FRE, MAT, POL, and ATT. Except for POL, all of the variables have manifest effects on collaboration levels in supply chain (sig.<0,05). The result also reveals that assumptions of linear relationship, normal distribution of residual, heteroskedasticity, and independence of errors, are not violated. With VIF index smaller than 2, it

can be concluded that there is no multicollinearity. The following is the multiple regression equation:

COL = 0.428 POW + 0,352 MAT + 0,285 TRU + 0,243 FRE + 0,161 ATT

5. Conclusion and suggestions

a. Conclusion:

The EFA reveals that there are six influential factors in supply chain collaboration, namely *trust, power, maturity, frequency, policy,* and *attitude*. However, they explain only 69.689% of the research issue, which implies that many other influential factors remain unknown. The regression result indicates that five factors remain influencing supply chain collaboration with the *power* factor having the strongest impact (beta 0.428) and *attitude* the weakest impact (beta=0.161). The latter was recently introduced into research models in the Vietnamese wood industry. Despite the negligible impact, it implies to wood enterprises that only when they think of (or have awareness of) cooperation do they take actions to make their partners cooperate.

b. Discussion and suggestions:

Supply chain collaboration is a new issue in Vietnam although studied by some international researchers. Compared with prior researches, this research not only reconfirms the previous known influential factors including *power, maturity, trust,* and *frequency*, but it also identifies another influential factor in supply chain collaboration, namely *attitude*. In Vietnam, where the concept and application of collaborative supply chain are still unfamiliar, the *attitude* or *awareness* factor is considered indispensable for reflecting business operation of the wood processing industry.

This finding implies that in order to enhance the effectiveness of supply chain, the very enterprises – the core factor – should pay more attention to supply chain cooperation by proactively establishing cooperation within a cluster of enterprises in the same province to increase their strength. With cluster development, Vietnamese wood processing enterprises can overcome such difficulties as shortage of raw materials and labor, and easily negotiate with their business partner to gain legitimate business interests. To achieve this target, it requires the enterprises' efforts and the effective roles of their organizations and associations which must act as a bridge for enterprises to meet and exchange information in the industry. Thus, the government should take positive measures in establishing clubs, associations and promotion centers where talks between wood processing enterprises can take place. In the context of intense competition, these organizations should focus on the problem at heart: to cooperate or to close down?

c. Limitations of this research and recommendations for future researches:

This research attempted to identify six influential factors on supply chain collaboration, but only five of them show their impacts on research targets. However, it employs only a convenient method, that is, it only focuses on domestic-invested enterprises and ignores a major group in the wood industry, namely foreign-invested or joint-venture enterprises, which make up a big share in the aggregate import/export turnover of the industry. This means that the research sample inadequately reflects the nature of connection – cooperation in supply chain. Additionally, the six factors which are seen as influential in supply chain collaboration can only explain 69.689%, so the remaining 30.311% belongs to other latent influential factors that this research fails to explore. Future research can employ a larger sample and find out more factors to improve the present model■

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