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A FRAMEWORK TO SUPPORT THE DECISION OF VERTICAL INTEGRATION STRATEGY

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Abstract

This paper proposes a decision model of vertical integration which is based on some factors of Transaction Cost Economics (TCE): asset specificity, the uncertainty of the supplier and the uncertainty of the buyer. In the literature, there is a lack of a decision support model which will help the strategic managers of the firms in their vertical integration decisions. The proposed model in this paper was developed based on the approach of organizational design developed by Burton and Obel (1998). The model provides suggestion about making or not making vertical integration by indicating the level of certainty of the decision. The suggestions were developed using the concept of "If-then rules". These rules were created using the research finding of the vertical integration studies in the related literature, which were sometimes conflicting because even with the same conditions the findings could be completely opposite of each other. In order to deal with this confliction, the findings of literature were integrated into the model, using Certainty Factors Theory. The model was applied to the 9 raw materials of 5 different firms and the firm managers were informed about the recommended vertical integration decision.

Keywords
Vertical Integration, Transaction Cost Economics, Certainty Factors Theory

1. INTRODUCTION

Integration strategy has a very important place in global world economy, so many research studies have been carried out to find which situational factors are being taken into account for the vertical integration decision. Some examples of studies carried out within the last two years are Fetz and Filippini (2010), Dai and Tang (2009), Howell, et al. (2010), Hwang, et al. (2010), Bunn, et al. (2010), Fernandes and Tang (2010), Acemoglu, et al. (2009), Everaert, et al (2010), Schwens and Kabst (2009), etc. However, these studies do not provide decision support to firm managers, since they are not easing the decision process. Some studies are mainly aimed only for research and have a complex language, and managers do not have enough time and/or knowledge level to understand and apply the research findings in the real business world. Moreover, some studies find different strategies for the same conditions. For instance, when there is high level of asset specificity, David and Han (2004) find it is better not to make vertical integration, while Leiblein and Miller (2003) find the reverse. In this paper, a framework is proposed to save the managers from this complexity and to ease their decision processes about vertical integration. The configuration of the model is based on Certainty Factors Theory. The content of the rules proposed in the decision model uses Transaction Cost Economics Theory.

The rest of the paper is organized as follows. First, general information is given about vertical integration strategies and Transaction Cost Economics. Then the proposed model and application of the model is explained. The conclusion section covers future research.

2. VERTICAL INTEGRATION STRATEGIES

Vertical integration is the situation in which the firm produces the necessary raw materials/materials within the firm instead of supplying them from outside. According to Sorenson (2003), vertical integration is an observable characteristic which reflects the degree of interconnection in the production stage and helps the improvement of

interdependencies within the firm. Vertical integration has also effects on market power potential and creates power over the suppliers (Bunn, et al., 2010, D'Aveni and Ravenscraft, 1994).
The factors which are affecting vertical integration decisions are explained by two theories in the literature which are Transaction Cost Economics (TCE), and Resource Based View (RBV). The main advantage of TCE is reducing the costs, while RBV deals with product characteristics, such as product quality. The model in this paper uses TCE.

3. TRANSACTION COST ECONOMICS

TCE theory was introduced by Ronald Coase in 1937, and it supports the idea of internalizing a management structure which minimizes the management costs and the control costs of transactions in terms of interaction with a transaction's main dimensions which are asset specificity, uncertainty and transaction frequency (Zhao et al., 2004).

The first dimension of TCE is asset specificity. Specific assets are the ones whose value becomes less if they are switched to alternative transactions and consequently whose value is not fully salvageable if the relation breaks down (Young-Ybarra and Wiersema, 1999). Oliver E. Williamson describes uncertainty, which is the second dimension of TCE, as situations in which it is impossible for a decision maker to decide the whole branches of a decision tree (Walker and Weber, 1984). The third dimension of TCE is transaction frequency, which means the recurrence of a transaction in a continuous or frequent way which assures the effective usage of the resources which are used for that transaction (David and Han, 2004).

Since the researchers are mainly working on asset specificity or uncertainty, this study focuses on them excluding transaction frequency.

4. THE PROPOSED MODEL AND APPLICATION OF THE MODEL

In the development stage of the model, a literature survey on Vertical Integration Strategy was conducted to develop the "If-then" rules. As mentioned before, there are mainly two theories that affect vertical integration decisions, RBV and TCE. In this study, some factors of TCE were taken into consideration, which were uncertainty of the supplier (US), uncertainty of the demand (UD), asset specificity of the firm (AF) and asset specificity of the supplier (AS). According to the model, these factors formed situation factors which would be taken into consideration during the decision process of firm managers. Each one of the factors was divided into two categories, as high and low. Since, there were four situation factors, a firm manager would have to be faced with 2^4=16 situations to make a decision. These situations were given in Table 1.

Table 1: The Decision Situations Table

	US	**UD**	**AF**	**AS**
1	Low	Low	Low	Low
2	Low	High	Low	Low
3	Low	Low	Low	High
4	Low	Low	High	Low
5	Low	Low	High	High
6	Low	High	Low	Low
7	Low	High	High	Low
8	Low	High	High	High
9	High	Low	High	Low
10	High	High	High	High
11	High	Low	Low	Low
12	High	Low	Low	High
13	High	Low	High	High
14	High	High	Low	Low

	US	UD	AF	AS
15	High	High	Low	High
16	High	High	High	Low

Each one of the 16 different situations in Table 1 formed the "IF" part of the model, such as "What should a firm do IF US is High, UD is Low, AF is Low and AS is High?".

After forming the "IF" part of the model, the general statements of "THEN" part, which formed the decision types, were constituted according to the CF logic of Sztainberg (2008). These decision types are as follows: 1) The firm mustn't integrate vertically. 2) The firm shouldn't integrate vertically. 3) The firm should protect the present structure. 4) The firm should integrate vertically. 5) The firm must integrate vertically.

After forming the "If" conditions and decision types, Certainty Factors Theory was used in order to develop the "If-Then Rules". According to Levine, et al. (1990), Certainty Factor (CF) is the value which approximately shows the reliance of the experts about the accuracy of a rule. The certainty values change between (-) 1 and +1. In order to calculate a composite certainty factor measure for two different CF values (CF_1 and CF_2), the below given equations are used:

$$CF(CF_1, CF_2) = \begin{cases} CF_1 + CF_2 * (1-CF_1) & \text{,if } CF_1>0 \text{ and } CF_2>0 \quad (1) \\ (CF_1 + CF_2) / (1 - \text{minimum } [|CF_1| \text{ and } |CF_2|]) & \text{,if } CF_1<0 \text{ or } CF_2<0 \quad (2) \\ CF_1 + CF_2 * (1 + CF_1) & \text{,if } CF_1<0 \text{ and } CF_2<0 \quad (3) \end{cases}$$

Here, CF_1 is the reliability degree of the first condition, and CF_2 is the reliability degree of the second condition. $|CF_1|$ and $|CF_2|$ are the absolute values of CF_1 and CF_2, respectively, and CF (CF_1, CF_2) is the composite measure of CF_1 and CF_2 (Sztainberg, 2008).

The Certainty Factors of each dimension (US, UD, AF, AS) were determined according to the evidence taken from the literature findings. The most important characteristic that have an effect on vertical integration decision is the Asset Specificity of The Firm, since almost all researches support vertical integration when its level is high, so the highest CF value was assigned to AF as 0,75 for being High, and (-0,75) for being Low. Next comes the Uncertainty of the Supplier as 0,60 for being High and (-0,60) for being Low. The Asset Specificity of the Supplier has a negative impact on vertical integration decisions, so its value was assigned as a positive value (0,55) for being Low and a negative value (-0,55) for being High. The least important characteristic is the Uncertainty of the Demand, so it got the smallest CF values, as 0,35 for being High and -0,35 for being Low.

The "Then" part of the model is identified according to the composite CF values of the "If" parts of the conditions. The associated decision types were assigned according to the composite CF values, based on Sztainberg (2008). These types are shown in Table 2.

Table 2: The Associated Decision Types of The Model's Certainty Factors System

Composite Certainty Factor Value	Associated Decision Rule
between (-)0.81 and (-)1.0	The firm mustn't integrate vertically.
between (-)0.39 and (–)0.80	The firm shouldn't integrate vertically.
between +0.39 and (-)0.40	The firm should protect the present structure.
between +0.79 and +0.40	The firm should integrate vertically.
between +0.8 and +1.0	The firm must integrate vertically.

After assigning the Composite Certainty Factor Values, "The Vertical Integration Decision Model" was formed as in Table 3. Here, in Operation 1, Uncertainty of the Supplier and the Uncertainty of the Demand were taken into account together and a composite CF measure was calculated. Then in Operation 2, the result of Operation 1 (CF_1) and the Asset Specificity of the Firm were taken into account together and a composite CF measure was calculated.

As the last calculation, in Operation 3, the result of Operation 2 (CF_2) and the Asset Specificity of the Supplier were taken into account together and a composite CF measure was calculated. According to the result of Operation 3 (CF_3), the vertical integration decision of the firm was determined, referring to Table 2.

Table 3: The Vertical Integration Decision Model

	CF value of US	**CF value of UD**	**CF value of AF**	**CF value of AS**	**Operation 1 CF_1(US,UC)**	**Operation 2 $CF_2(CF_1, AF)$**	**Operation 3 $CF_3(CF_2, AS)$**	**Decision Rule**
1	Low (-0,60)	Low (-0,35)	Low (-0,75)	Low (0,55)	-0,74	-0,94	-0,86	Mustn't Integrate Vertically
2	Low (-0,60)	High (0,35)	Low (-0,75)	Low (0,55)	-0,38	-0,85	-0,66	Shouldn't Integrate Vertically
3	Low (-0,60)	Low (-0,35)	Low (-0,75)	High (-0,55)	-0,74	-0,94	-0,97	Mustn't Integrate Vertically
4	Low (-0,60)	Low (-0,35)	High (0,75)	Low (0,55)	-0,74	0,04	0,57	Should integrate vertically
5	Low (-0,60)	Low (-0,35)	High (0,75)	High (-0,55)	-0,74	0,04	-0,53	Shouldn't Integrate Vertically
6	Low (-0,60)	High (0,35)	Low (-0,75)	High (-0,55)	-0,38	-0,85	-0,91	Mustn't Integrate Vertically
7	Low (-0,60)	High (0,35)	High (0,75)	Low (0,55)	-0,38	0,59	0,82	Must Integrate Vertically
8	Low (-0,60)	High (0,35)	High (0,75)	High (-0,55)	-0,38	0,59	0,1	Should protect the present structure
9	High (0,60)	Low (-0,35)	High (0,75)	Low (0,55)	0,38	0,85	0,93	Must Integrate Vertically
10	High (0,60)	High (0,35)	High (0,75)	High (-0,55)	0,74	0,94	0,86	Must Integrate Vertically
11	High (0,60)	Low (-0,35)	Low (-0,75)	Low (0,55)	0,38	-0,59	-0,1	Should protect the present structure
12	High (0,60)	Low (-0,35)	Low (-0,75)	High (-0,55)	0,38	-0,59	-0,82	Mustn't Integrate Vertically
13	High (0,60)	Low (-0,35)	High (0,75)	High (-0,55)	0,38	0,85	0,66	Should integrate vertically
14	High (0,60)	High (0,35)	Low (-0,75)	Low (0,55)	0,74	-0,04	0,53	Should integrate vertically

	CF value of US	CF value of UD	CF value of AF	CF value of AS	Operation 1 CF_1(US,UC)	Operation 2 $CF_2(CF_1, AF)$	Operation 3 $CF_3(CF_2, AS)$	Decision Rule
15	High (0,60)	High (0,35)	Low (-0,75)	High (-0,55)	0,74	-0,04	-0,57	Shouldn't Integrate Vertically
16	High (0,60)	High (0,35)	High (0,75)	Low (0,55)	0,74	0,94	0,97	Must Integrate Vertically

During the application stage of the model, in order to decide whether US, UD, AF, and AS were high or low, a survey was formed by adapting the survey of Gulbrandsen B, et al. (2009). It was applied for 9 raw materials in 5 firms, where X was a raw material of Firm A, Y was a raw material of Firm B, Z was a raw material of Firm C, Q was a raw material of Firm E, and T, F, W, N, and M were raw materials of Firm D. According to the survey results, Firm A should integrate vertically for X, and Firm D should integrate vertically for T and F. Firm B must integrate vertically for Y, Firm D must integrate vertically for W and N, and Firm E must integrate vertically for Q. Firm C shouldn't integrate vertically for Z. Firm D should protect the present structure for M.

5. CONCLUSION

A model was proposed in order to help the strategic managers of the firms in vertical integration decisions, by taking into consideration the asset specificity, the uncertainty of the supplier and the uncertainty of the demand in order to help the firms' decisions on vertical integration regarding the research findings in the literature, which makes this paper unique. The TCE characteristics might be in high or low values, and this would affect the firms' decisions, so Certainty Factors Theory was used in order to give the integration decision

The model was applied to 9 raw materials of 5 firms. The results have been shared with the firms; however there haven't been any returns about the application of the decisions yet.

The model is based on only one theory (TCE), so this causes limitations at the analysis of the model. Besides this, the model does not take into account some factors, such as transaction frequency, firm size, firm age, etc. For further study, these limitations will be expanded, and different theories, such as Resource Based View, will be taken into account in order to understand their effects on vertical integration decisions, and the decisions obtained from different theories will be compared. Moreover, the number of applications may be increased and vertical integration strategy decisions may be determined by using different statistical methods.

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