

**FRONTIERS OF BUSINESS,  
MANAGEMENT AND ECONOMICS**  
**An Interdisciplinary Collection of  
Managerial Research Findings and Breakthroughs**

*Edited by*  
**Mehran Nejati**



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*Frontiers of Business, Management and Economics:  
An Interdisciplinary Collection of Managerial Research Findings and Breakthroughs*

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# Propagation Effects of Disruptions on Global Supply Chain Performance: A Systemic Dynamics Approach

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## Abstract

Understanding the security disruptions and how their effects propagate through the supply chain is critical to promote security and efficient movement of goods. This research proposes system dynamics as an effective modeling technique for analyzing the effects of the materialization and simultaneous propagation of disruptions of security at various points in export supply chains (ESC). Finally, as a result of the phenomenon of propagation of the disruptive effect, it can be said that although the integrated supply chains are fast and cost-efficient, they are also susceptible to shocks that can rapidly escalate from localized events into broader disruptions.

**Key words:** Supply chain risk, System dynamics, Propagation of disruption; Cross border effect, Transportation.

## 1. Introduction

Currently, the most important economies in the world are looking for promoting the timely, efficient flow of legitimate commerce while protecting and securing the supply chain from exploitation, and reducing its vulnerability to disruption. [1, 2]

In this regard, The White House [3] recently released The National Strategy for Global Supply Chain Security (NSGSCS). The document recognizes that the development of nations depends on international efforts to save and ensure the transit of goods through the global system of supply chains. In addition, it exposes the need to assess and understand the effects of disruptions mainly generated by three factors: i) natural disasters; ii) criminal acts, and iii) terrorist acts. However, despite the clear current interest in understanding the effects of the disruptions, some authors [1, 2, 4] have identified that there is actually no clear consensus regarding the elements that should be analyzed to contribute to an effective management of the risk of disruptions in supply chains. In addition, there is no evidence of analysis models to quantify dynamically the propagation effect of the disruptive impacts from the materialization of a given risk. In fact [2, 4] demonstrate that the research area in the field of risk propagation in supply chains remains relatively unexplored. Under the challenge

of linking security and efficiency as a single goal, the aim of this article is to present a dynamic assessment model able of establishing analysis scenarios to measure the impact in a global supply chain as a result of the disruptive effect propagation caused by the materialization of risks in an export supply chain.

## 2. Literature Review

As a result of unfortunate events occurred over the last decade in which global supply chains have been the target of disruptions such as terrorist attacks, natural disasters among others; interest to understand risk and how to deal with the effects of the disruptions in supply chains has arisen. In this sense, important works have been oriented to the development of techniques for the identification of areas of vulnerability in the chain [5]. However, even when managers recognize that disruptions can have devastating consequences throughout the supply chain, at global level, in most organizations, strategies to mitigate them are generally not properly developed or are not even initiated [6]. In fact, [7] presented a statistic in which estimated that only 25 percent of the 500 world richest companies could handle a crisis by disruptions in the supply chain. In this sense, [8] have argued that the problem in risk management is that decision-makers are not clear on how to face and deal with disruptions. According to [5] the basic problem for risk management lies in that this can manifest itself in many different ways, virtually affecting any stage in the supply chain. Some authors [4, 9] suggest analyzing if the effects of the disruptions have local influence or if they may propagate to other members of the chain. In this way, as a result of the complexity of an analysis considering multiple variables evolving over time, the use of a systemic and dynamic approach is indispensable. In fact, [10] suggests the use of system dynamics to analyze and simulate disruptive events in transport chains. However, their analysis does not measure the “border effect”, whose assessment is fundamental to our research.

## 3. Model Description

As a result of the goal raised for our research and due to the variables of interest identified during the literature review, the multiple relationships between the different stages were identified. Therefore, we took the decision to refine a basic structure of supply chain, enabling the dynamic analysis of propagation of the impacts of the materialization of the risk in a supply chain. Consequently, the supply chain model built from the case study presented and analyzed by [11] and was made up of the following basic components: supplier of raw materials; component supplier; international border; buffer managed by component supplier; and manufacturer (Fig. 1). The customer demand flows from the lowest stage (manufacturer) of the supply chain, to the upper stage of the chain (supplier of raw materials).

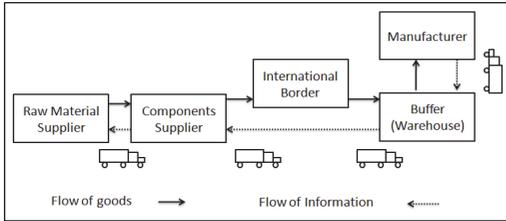


Figure 1. Flow of goods and information.

The delimitation of the proposed supply chain structure was valid due to several key aspects: i) No pre-existing quantitative work considering global supply chains were identified and ii) our main research objective was to develop a first basic model capable of establishing dynamic analysis scenarios to measure the propagation of disruptive events.

A relevant way of analyzing complex systems is their process simulation through the technique of system dynamics. This tool is used when the analyst realizes that the structure of a system counts with multiple variables interacting dynamically, making the understanding of its performance very complex and, therefore, to predict its future behavior [12]. Its flexibility to analyze multiple interactions over time through the causal or structural analysis (structure of relations of influence between variables, parameters and data) of the addressed problem, allows obtaining an ordered representation of the studied system [12].

Causal diagrams are maps that show the causal relationships between variables of the system. The arrows indicate the causal direction of influences and the signs on the arrows (+ or -) indicate the polarity of the relations. A positive polarity means that growth (decrease) in the independent variable creates growth (decrease) in the dependent variable. The negative signs mean that an increase (decrease) in the independent variable generates in the dependent variable a decrease (increase) [13].

For the model here proposed, key variables at each stage of the system were identified:

- *Customer Demand ( $D_s$ )*: It is the customer demand for each corresponding period ( $s$ ). Where  $s=1...180$  periods and  $s_{i-1}$  represents the demand of the previous period.
- *Total Orders Placed (TOP)*: It is the total demand to be assorted by the inventory level and is calculated as:

$$TOP = D_s + OB \dots \dots \dots (1)$$

- *Order Backlog (OB)*: It is the amount of orders that are still outstanding to be delivered to the client and is computed as:

$$OB = D_s - GSC \dots \dots \dots (2)$$

- *Goods Shipped to Customer (GSC)*: It is the amount of goods sent in each period to the instant client. GSC is computed as:

$$GSC = \min(IL, TOP, MGS) \dots \dots \dots (3)$$

Where *MGS* is the maximum capacity of goods to move from one stage to other and is set in  $\pm 33\%$  of  $D_s$  units.

- *Inventory Level (IL)*: It is the behavior of the stock level for each stage of the supply chain. *IL* is calculated using:

$$IL(t) = IL(0) + \int (ITI - GSC) dt \dots \dots \dots (4)$$

- *In Transit Inventory (ITI)*: It is the amount of inventory in transit. It represents GSC of the upper echelon. *ITI* is computed as:

$$ITI(t) = ITI(0) + \int (TBD - GSC) dt \dots \dots \dots (5)$$

- *Total Buffer Demand (TBD)*: represent the total period demand. *TBD* is determined by the following equation adapted from [25]:

$$TBDs = \max(0, \widehat{O} + \alpha(SS - IL) + \beta(DITI - IP - IL) \dots \dots \dots (6)$$

- *Safety Stock (SS)*: It is the desired *IL*. It helps you make the adjustments necessary to maintain the desired inventory level to avoid it growing or fall without control.
- *Desired in Transit Inventory (DITI)*: It is the desired level of inventory in transit. It helps make the adjustments necessary to maintain the level of desired *ITI*
- *IP* is the inventory position and is calculated as follows:

$$IP = ITI - IL \dots \dots \dots (7)$$

- $\widehat{O}$  represent a forecast of demand and is calculated:

$$\widehat{O} = n\widehat{O}_{s_{i-1}} + (1-n)\widehat{O}_{s_{i-1}} \dots \dots \dots (8)$$

According to [14],  $n$  is the demand smoothing factor  $0 < n < 1$ . As in our model the demand distribution is known so  $n = 0$  and there is not necessary computing a forecast and then:

$$\widehat{O} = \widehat{O}_{s_{i-1}} = D_{s_{i-1}} \dots \dots \dots (9)$$

The constants  $\alpha$  and  $\beta$  are adjustment parameters controlling the change in order quantity when the actual inventory and the supply line, respectively, deviate from the desired targets.

Once identified the variables of interest we continued to build the causal diagram to understand the relationships that govern the behavior of the system. The causal diagrams are shown and described below. (Fig. 2 – Figure is displayed at the end of manuscript)

In the Causal diagram, we can identify two processes around the variable of interest *IL*.

On the one hand there is the loop of demand, which has a positive polarity and is identified in the causal diagram as **R1**, **R2** and **R3**. On the other hand, we can see the provisioning loops which are represented by **B1** and **B3** and also possessing a sub process corresponding to the inventory in transit *ITI*, respectively named **B2** and **B4**.

In Loops **R1**, **R2** and **R3**, we can notes that the variable *TOP* is positively influenced by *Ds* and the *OB* accumulated from previous periods. Likewise *TOP* has a negative relationship with the *IL* that is responsible for meeting the customer's demand. The variable *GSC* is equivalent to the minimum amount of goods between total demand and the level of available inventory. Thus, pending orders accumulate in the variable *OB*. Finally the accumulation of pending orders increases the amount of order for the next term. This contributes to its having a self-reinforcing cycle involving on the one hand the *IL* and decrease the increase in *TOP*. As a result, the loop leads to the entropy of the system.

Likewise, Loops **B1** and **B3** consist in providing the *IL*, and that as described above both have the structure of a goal seeking. This condition maintains the *IL* around a *SS*, which allows to constantly balancing the subsystem. While in loops **R1**, **R2** and **R3**, we note that *IL* decreases as goods are sent to the client, we can now identify that *IL* increases as it receives *ITI*. This *ITI* actually represents the goods that were sent by the immediate provider to the client. Thus, if *ITI* is high, the gap between the level of *SS* and *IL* will be less. This condition implies that fewer *TOP* with the supplier and so the system will have a smaller amount of *ITI* in the next period. Accordingly, the *IL* will receive fewer *ITI* and comparing again *IL* and the *SS*, there will be a bigger difference with respect the desired level. This new condition generates a greater amount of orders being placed with the supplier, and subsequently an increase of *IL*, thus constantly balancing the system around the desired *SS*. Finally, Loops **B2** and **B4** monitor the *ITI*, which directly influences the amount of orders. I.e. the orders are based on the difference between *DITI* and current *ITI*.

#### 4. Discussion and Conclusion

With the interest of doing an in-depth analysis of the proposed model, both for the testing phase, as for the achievement of results, one of the three disruptive scenarios set out in the NSGSCS was selected. This scenario consists in the interest of evaluating the disruptive effects caused to supply chains when the natural disaster materializes.

The simulation of the model was carried out under STELLA 9.1.3, in a 180-days period of time corresponding to a six-month planning horizon. To illustrate how uncertainty on border crossing times affects the *SS*, we considered different scenarios taking data from the case study "Production line" proposed by [12], which is an international company with exportation activity whose data are described following. For the simulation of the model the manufacturer daily demand of this product ( $\psi$ ) was considered as the input to the model. This demand is usually delivered, with 300 units per day and a standard deviation of 20 units. The assembly plant requires a *SS* of 5-days with the buffer. We considered using a random border crossing times, which according to [11], vary from 1.77 hrs to 16.77 hrs.

It should be noted that all disruptive scenarios have as starting point of disruption the day 50 and the initials values of the system are show in table 1.

The analysis consider the base behavior of the chain, in which there is a level of average inventory of 1600 pieces, the average flow of *GSC* was also of 300 pieces. Thus the *ITI* stands on a level of 300 pieces. Under these conditions there are *OB*. Demonstrating that the balance of the system among units to their demand and customer shipments exist (Fig. 3)

Table 1. Supply Chain Values.

	Buffer (Warehouse)	International Border	Components Supplier
IL (units)	1600		1000
SS Level (units)	1600		1000
ITI	300	300	300
DITI	300		300
Transit Time	2 days	Min 1.77 hrs. Max 16.77 hrs.	1 days
IL Handle Cost (US\$)	2.5		1
IL Cost of Lost (US\$)	175		57
ITI Cost of Lost (US\$)	125		125

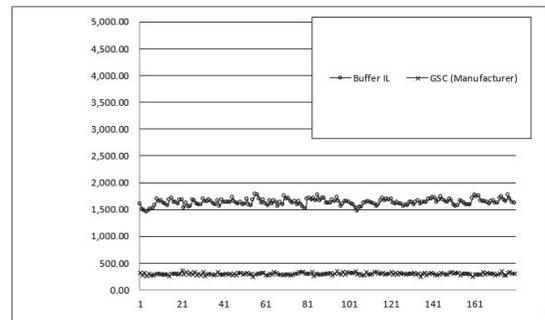


Figure 3. Buffer IL vs. GSC

#### 4.1. Analysis under disruption scenarios

Based on [15] and analyzing the impact of natural disruptions, can be identified that 80% of the disruptions affected *ITI* increased the time of delivery. That's way in this research the simulation consist of the generation of 3 disruptive scenarios similar to the caused in 2010 by Hurricane Alex that left without communication by land for five days to the cities of Monterrey and Nuevo Laredo Mexico, affecting severely to the *ITI* [16]. In this way, to know the effect of border crossing when the time of disruption is less to *SS*, the first scenario simulates a disruption of *ITI* of three days between component supplier and buffer. The second scenario simulates a 5 days disruption, that corresponds to a period of disruption equals to the one generate by Alex. Finally the

research wants to display the potential devastating impact generated by ten days of disruption. As a result, we obtain three different impacts on Buffer *IL*. (Fig. 4).

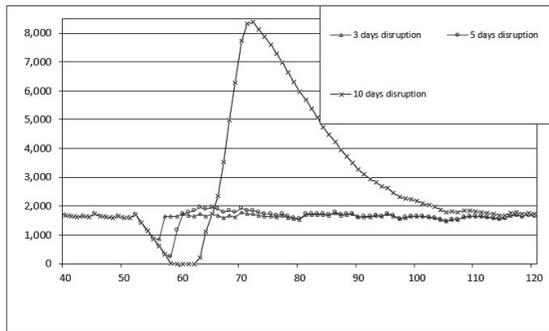


Figure 4. Buffer Inventory Level.

Regarding the analysis of the behavior of inventories, all periods of disruption can confirm the steps expressed qualitatively by [17]. For the first disruption scenario of 3 days, a period of “normal” operation before the impact, which occurs in the 50 day was presented at an early stage. In a second phase, a delay effect affects the *IL* of the company. There is a gradual reduction of *IL* as a result of maintaining the flow of deliveries to the client, but without being re-provisioned because of the closure of the border. Finally a third period shows how the behavior of the *IL* regulates itself on day 60. In the case of the global manufacturer company in study thanks to coverage of inventory of 5 days, the customer demand could be fulfilled. For the second scenario of disruption, established in five days, we could verify once concluded the second phase, a breakdown of *SS* occurs and contrary to what is observed in the previous disruption scenario, the delivery of goods to the client was compromised by a lapse of 1 period. In this case, the supply chain requires 26 periods to achieve a desired operation state. In addition, as a result of failing to fully comply with the demand, an increase in *IL* of 125 % versus the base scenario was observed. This was a result of restarting the shipping operations to complete existing orders and missing agreements. Finally, in the third scenario with 10 day disruption, we observed a similar behavior to the one identified in the previous scenario, but with sharper consequences for the company. It was checked that while there were only 6 days of shortage of product, the supply chain requires 63 periods to achieve a desired operation state. A large volume of *OB* was also created, which led to the supply system to increase the *IL* of 530%. These increases in the *IL* after restarting operations are relate to what demonstrates by [31], he shows that managers tend to pay more attention to pending orders than to the supply line, leading to place very large orders with the provider. A performance verified in the 3 disruptive scenarios under analysis.

As a result of the propagation effects studied here, we can affirm that although the world class companies have

currently integrated supply chains which are fast and cost-efficient, they are also susceptible to shocks that can rapidly escalate from localized events into broader disruptions. On the other hand, our quantitative results checked what some authors [17, 19] proposed qualitatively. These authors argued that the time during which the supply chain is under a disruption becomes a key factor to determine the impact of the deviations generated to the chain. As our research demonstrates, this time can make the difference between a recovery or catastrophic and unrecoverable losses. In this sense, this research found that based on a better understanding of the systemic effects of their decisions in *ESC*, managers would be prepared to mitigate the impact of disruptive events.

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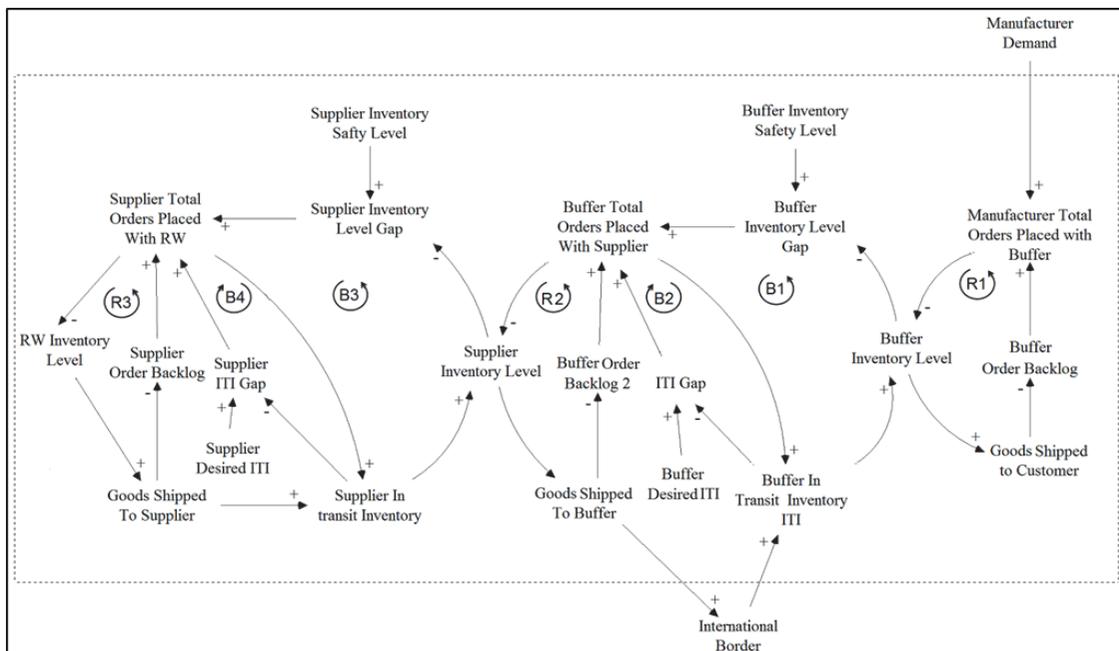


Figure 2. Casual diagram of the interaction relations of the Supply Chain System

# Entrepreneurship Education in Agricultural Advisory Services of Iran

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## Abstract

The major purpose of this study was to examine the perception of members of agricultural advisory services in the Mazandaran Province of Iran about the role of educational factors in developing entrepreneurship. The total population of the study was consisted of 1221 members of agricultural advisory services in the nine townships of Mazandaran Province and 154 were selected based on Cochran formula. The main instrument of the study was questionnaire and its validity and reliability was confirmed. As the results of regression analysis show that 22 percent of variance of entrepreneurship development is explained by education factors.

**Key words:** Entrepreneurship, Agricultural Advisory Services, Educational Factors, Iran

## 1. Introduction

Iran is facing an employment crisis in agriculture sector. It has been a challenge for policymakers to create employment for university graduate in the agriculture. Ghiasvand Ghiasy et al concluded that agriculture sector in Iran encounter with challenges such as lack of skillful human resources [1].

Indeed, the entrepreneurship is a key element in increasing employment, a solution to fight against the unemployment crisis, a response to community diverse demands; therefore, it is considered as one of the important fundamental aspects in agricultural development plans [2, 3, 4,].

Goldmark and Rosengard stated that entrepreneurship development programs have various components such as educating unemployed. Policy makers and planners must work to realize the goal of sustainable entrepreneurship development and employment promotion [5].

Government of Iran has been trying to solve employment problems in agriculture sector by establishing private enterprises. Public sector by itself can not accommodate a large number of unemployed in this sector and in this regard, government has decided to establish agricultural advisory services [6].

The development of small enterprises is a mean of creating employment opportunities especially for marginalized population in the rural areas [7].

Ministry of Agriculture with cooperation of Agricultural, Natural Resources Engineering Organization has started a process of hiring university graduates for providing assistance to farmers [8].

## 2. Literature Review

Agricultural advisory services have been an innovation to increase effectiveness of public sector extension. Public sector has not been able to help farmers and many countries established private consulting services to provide services [9].

Madukwe pointed out that the focus of private consulting services was to make extension services more responsive to client needs and changing environmental conditions [10].

However, these enterprises have not been successful in creating and sustaining employment, as it was expected. One way to increase the potential and improve their performance is to facilitate the process of entrepreneurship.

Based on the latest report in the Mazandaran Province, there are 103 agricultural advisory service companies (AASC). The members of AASC are those with at least a degree in agriculture.

Ghiasvand Ghiasy et al in a research about entrepreneurship development in agricultural cooperatives of Iran reported a relationship between educational factors and entrepreneurship development [1].

In a research by Maghsoudi and Davodi, educational factors were determined as an important factor in developing entrepreneurship [11].

Lashgarara et al also reported the same conclusion and found out that there was a relationship between educational factors and entrepreneurship development [12].

An understanding of educational factors influencing development of entrepreneurship in advisory services of Iran is crucial for creating the new opportunity and encouraging the existing and new into more entrepreneurial activity. The question is what are the educational factors influencing the entrepreneurship development in agricultural advisory services?

The purpose of this study was to examine the role of educational factors in developing entrepreneurship in agricultural advisory service in the Mazandaran Province.

## 3. Methods

The methodology used in this study involved a combination of descriptive and quantitative research and survey method was used to collect the data. The total population of this study was 1221 members of private advisory service in seventeen townships in Mazandran Province of Iran. By using Cochran formula and based on proportionate sampling method, 154 respondents were selected from nine townships. The formula for determination of sample size was:

$$n = \frac{t^2 pq}{d^2}$$

A series of interviews was conducted by experts and a questionnaire consists of open-ended and close-ended questions were developed to collect the data. Data was

collected by using face-to-face method. Variables and their measurement scale are presented in table 1.

*Table 1. Variables and their measurement scale*

Variables	Scale
X1. Respondents view about role of entrepreneurship education in agricultural advisory services: Sustainability of income Improving income Increasing membership	Likert
X2. Role of educational factors in developing entrepreneurship in agricultural advisory services: Workshops Visit to successful enterprises Contact with successful entrepreneurs Introducing successful companies Access to journals	Likert
X3. Educational level	Categorical
X4. Age	Categorical
X5. Farming Experiences	Categorical

Measuring respondent's attitudes towards the role of educational factors in developing entrepreneurship education in agricultural advisory services has been achieved largely through structured questionnaire surveys. The usual questionnaire approach to measure attitude is to include a range of Likert items (ranging from 1 as totally inadequate to 5 as totally adequate) to operationalize the attitude construct.

The questionnaire consists of three sections. The first section was developed to measure the attitudes of respondents about role of entrepreneurship education in agricultural advisory services. The next section was questions about role of educational factors in developing entrepreneurship in agricultural advisory services. The third section was used to find out the personal characteristics of respondents.

Content and face validity were established by a panel of experts consisting of faculty members at Islamic Azad University and experts in the field of entrepreneurship. A pilot study was conducted with 30 participants who had not been interviewed before the earlier exercise of determining the reliability of the questionnaire for the study. Computed Cronbach's Alpha score was 81.0%, which indicated that the questionnaire was highly reliable.

The dependent variable in this study was the perception of respondents about entrepreneurship development in agricultural advisory services and was measured by

responding to three statements. The independent variables were role of educational factors in entrepreneurship development in agricultural advisory services (5 statements).

For measurement of correlation between the independent variables and the dependent variable correlation coefficients have been utilized and include Spearman test of independence. The stepwise regression method was also used to explain the variance in the perception of respondents about role of educational factors in entrepreneurship development in agricultural advisory services.

#### 4. Results

The results of the study show that average age of respondents was 32 years old and more than 64 percent were male. The educational level for majority of respondents was bachelor degree and most of them had a degree in agronomy (37%). The mean of working experience was 3.5 years and average of farming experience was seven years.

In order to measure the perception of respondents about entrepreneurship situation in the advisory services, respondents were asked to respond to the questions. The majority of respondents indicated that entrepreneurship situation in the advisory service were inadequate (70.8%) while only one respondents reported the situation were adequate.

Table 2 shows the perception of respondents about current status of entrepreneurship in advisory service. Respondents were asked to respond to three statements: sustainability of activities, improving income and increasing membership. The results show that the status of sustainability of activities was somewhat adequate (mean=2.59) and increasing membership was determined to be inadequate (mean=1.79). This indicates that the status of entrepreneurship development in agricultural advisory services was somewhat adequate.

*Table 2: Means of respondents' views about status of entrepreneurship development in agricultural advisory services (1=totally inadequate; 5=totally adequate)*

Statements	Mean	SD
Sustainability of activities	2.59	0.73
Improving income	1.89	0.62
Increasing membership	1.79	0.80

Table 3 shows the means of respondents' views about educational factors which influence the entrepreneurship development in agricultural advisory services. As can be seen from this table, the highest mean refers to attending workshops (mean=3.24) and the lowest mean to access to entrepreneurship journals (mean=2.63).

*Table 3. Means of respondents' views about role of educational factors in affecting development of entrepreneurship in agricultural advisory services*

Perception statement		
	Mean	SD
Attending workshops about entrepreneurship	3.24	0.69
Visit to successful companies	3.12	0.79
Contact with successful entrepreneurs	3.06	0.80
Introducing successful companies in mass media	2.84	1.17
Access to entrepreneurship journals	2.63	0.90

1=very little; 5=very much

Spearman and Pearson coefficient was employed for measurement of relationships between the perception of respondents about entrepreneurship development as dependent variable and educational factors, knowledge level about entrepreneurship regulations and personal characteristics as independent variables. The results show that there was relationship between perception of respondents about entrepreneurship development in agricultural advisory services and educational factors and farming experience. It means that educational factors would influence entrepreneurship development and those respondents with experience in farming had better attitudes about entrepreneurship development in agricultural advisory services.

Table 4 shows the result for regression analysis by stepwise method. Independent variables that were significantly related to perception of respondents about developing entrepreneurship in agricultural advisory services were subjected to regression analysis. The result indicates that 23% of the variance in the perception of respondent could be explained by educational factors (Beta coefficient: 0.483, sig.: 0.000). Other variables were not statistically significant.

Table 4. Multivariate Regression Analysis

	B	Beta	T	Sig.
Constant	2.901	-----	5.509	0.093
Educational Factors	0.225	0.483	6.547	0.000

R<sup>2</sup>= .23

$$Y = 0.483 x_1$$

## 5. Discussion and Conclusion

As the results of regression analysis show that 23 percent of variance of entrepreneurship development is explained by education factors. The results are in accordance with findings of studies by Ghaisvand Ghiasy et al (2009) and Lashgarara et al [1, 12].

Based on the results of the study, there was correlation between the entrepreneurship development and educational factors in agricultural advisory services. This finding is consistent with research by Ghaisvand Ghiasy et al [1].

There was also a correlation between entrepreneurship development and farming experience. This result shows that involvement of members of agricultural advisory services in agricultural activities would influence their perception about entrepreneurship development.

The results of this study imply that attending educational workshops and visit to successful organizations was determined as the most important educational factors which affect the development of entrepreneurship in agricultural advisory services.

Entrepreneurial training not only would improve quality of entrepreneurs, but it could evolve and improve entrepreneurial skills. It is important to prepare grounds for members of agricultural advisory services to be familiar with dimension of entrepreneurship.

The results demonstrated that agricultural advisory services have not realized their full potential in entrepreneurial activities. Government should offer special entrepreneurial training programs for members and provide incentives for members with entrepreneurial potential.

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# Customer Focus Strategy in Business and Public Firms

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## Abstract

This paper discusses the role of customer focus strategy in improving customer satisfaction of both business and public firms. The premise of this paper implies that customer focus is a management strategy that is not only successful in the business setting, but also transferrable into the public service. Therefore, more focus should be given to intensify the customer related activities in the public firms, which in turn would contribute to higher levels of customer satisfaction.

**Key words:** Quality Management; Customer Satisfaction

## 1. Introduction

There are various strategies available in the literature that can be implemented for improving the level of customer satisfaction. Among others are just-in-time approach, client charter, zero defect, and customer relationship management. Many authors had reported the positive impact of these strategies on customer satisfaction [3; 4; 8]. While most previous studies on customer satisfaction had focused on business organization as their unit of analysis (for example: 4), there are still sectors, such as strategic consulting firms, that suffer from inadequate evidence about the determinant of customer satisfaction, as revealed by Harverila *et al.* [8]. A study on these issues among public firms is also comparatively less explored. This lack of attention may be due to the issue of customer retention and customer switching for public service being less relevant or prevalent when compared to business entities. It is essential for research to be conducted across sectors due to critics towards universality of management strategy [2]. As prescribed in the background section of this paper, the pushing power for public organizations in giving focus to customer issues is different from business organizations. While the latter is derived by stiff competition in the market [10], the public institution gives scrutinized attention to the customer issue because customers of the public services consist of important taxpayers and voters. As a tax payer, they expect governmental institution to deliver service at the highest quality grade as possible. The issue of customer switching is less relevant to the public service due to alternative providers of the same service are not available in the market or if any, the cost borne by the customer is almost definitely higher [6].

Although studies on customer satisfaction is replete in the literature, new drivers of customer satisfaction that have never been identified before continues to be revealed by more recent studies [8]. This would indicate that this research topic is not a dearth area, but still rich with potentials for exploration. However, most previous

studies on customer satisfaction are likely dominated by data from the business sector. Empirical studies performed in the public sector seem to receive inadequate treatment. This study is also relevant due to customer-related issues that continuously keep changing focus. Customer demands, expectations, and preference do not stop moving and evolving [11], which requires research on customer satisfaction to be continuously reexamined with more recent data and perspectives.

## 2. Literature Review

This section reviews the related literature and published works with the objective of critically examining previous studies and research efforts in the areas of customer focus strategy and customer satisfaction.

Customer satisfaction has remained an important research topic among researchers due to its close relationship with the issue of organizational sustainability. Customers with high levels of satisfaction are likely to perform repeat purchasing and disseminate their experience to other potential customers, which in turn would strengthen the reputation of a business in the market. Customer satisfaction is likely to be associated with the product or service itself, and the delivery process of related product or service. The service business has its own unique characteristics when compared to the business of physical products. As such, a service is attached to facets of intangibility, heterogeneity, inseparability, and perishability [1]. These unique facets of service are likely to influence the way a customer judges the quality of service. Due to increasing number of service businesses around the world, a study on customer satisfaction of service organizations deserves more attention from researchers. The coverage of the service sector should not be restricted to only the business sector, but also cover the public service as well. Many governments worldwide, including the Malaysian government, are continuously monitoring the levels of customer satisfaction of public service, including local authorities. Although much effort has been done, the level of service quality among local authorities in Malaysia is said to be varying among them [9]. Therefore, more empirical evidence is necessary to validate the efforts done in improving customer satisfaction of local authorities in Malaysia. The public sector organizations require their own empirical evidence, since they cannot rely on evidence from the business sector due to the differences of customer nature and expectation. As such, research performed on the business sector stresses on the impact of customer satisfaction on purchase intention, customer retention, and profitability [5]. All these goals seem irrelevant to the public sector. Public sector organizations are keen to improve customer satisfaction due to their responsibility in delivering the best service to the public, generally because the public are tax payers and voters in general elections.

Businesses strive for the best to retain existing customers by tackling the issue of customer satisfaction. The more

competitors there are in the market would mean that the risk of customers switching from one company to another is likely to be intense. For businesses, customers do business on their own decision. In other words, businesses compete between each other to be as customer friendly as possible. The scenario for the public service would seem different. In addition to the function of service provider, public departments also play the role of being an authority body of enforcement, and safeguard law compliance. As a service provider, customers would be happy if the service they received is in order. Although the issue about enforcement of rules and regulation is likely to have a negative relationship with customer satisfaction, previous studies indicated that stringent rule enforcement had only a small effect on customer satisfaction [5]. On the hand, the authors strongly recommend that the organization needs to continuously provide adequate attention on customer focus activities in order to achieve high customer satisfaction. This conclusion is also supported by Gowan *et al.* [6], where it was estimated that almost 70% of customers leave a company due to lack of personal attention, rude attitude of employees, and unhelpful service, and not related to quality of the physical components of the product.

This section continues with the discussion on what are the practices that constitute customer focus strategy. In other words, what activities or practices are attached to customer focused organizations. A discussion on this point would enable us to appreciate the uniqueness of the service sector, would which in turn influence the practice of customer focus. The service sector is different from merchandising and production sector because most of the transactions with the customers in the service process would involve a great deal of human behavior [6]. A service organization can improve customer satisfaction by providing appropriate training on important skills required to be instilled in the front-line staff [7]. In other words, customer focus strategy needs adequate focus on human related issues because the first impression of customers regarding the organization might be drawn from their experience in dealing with front-line staff. Therefore, front-line staff should be provided adequate authority to make decisions without delay and they should actively seek ways to improve the quality of service delivered without waiting for instructions from the supervisor. However, this should be regarded as a challenging task for local authorities as a public service where the work culture in public service is generally known to be associated with bureaucratic hierarchy structure.

In addition, customer focused organizations would, more often than not, give close attention towards customer feedback systems [3], particularly for service organizations where the process of service delivery involves mutual contact between employees and the customer [6, 13]. Feedback systems contain useful information about the emerging needs of customers as well as suggestions on how the service could be further

improved. For a customer feedback system to be effective, it requires strong involvement from the upper managers. Their role is not only in planning and running the systems, but also to take initiatives in maximizing the benefits that can be gained from the valuable information extracted out from the systems. Without proper implementation of feedback systems, it only invites more negative perceptions towards the service systems. However, there are also authors who revealed that customer feedback systems only provide superficial information about the customer experience, which does not aid the improvement agenda of organizations [12].

### 3. Conclusion

Discussion in the preceding paragraphs revealed that customer satisfaction is critical not only for the business community but also public service providers. Although the public service does not have problems in terms of customers switching from one brand to another, there are still expensive costs associated with decreasing customer satisfaction, such as low reputation and damaging image. Therefore, customer focus strategy is believed to be a useful strategy for both commercial and governmental entities.

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# Theoretical and Experimental Research on the Use of Expert Systems in Assessing Risks

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## Abstract

Decision assistance systems (expert systems - ES) are known in literature as knowledge based systems, because of the nature of processed information (knowledge). This article presents an expert system in which are included “3” economic models using tacit and explicit knowledge (knowledge of accounting nature which are taken from financial statements (Basic et al., 2011)), with which decisions are made for the future of metallurgical companies. Knowledge base comprises two classes of knowledge, which are processed by the inference engine (the inference machine works with rules such as: IF tacit/explicit knowledge AND / OR explicit/tacit knowledge ELSE explicit/tacit knowledge THEN knowledge/ conclusion. The inference machine will provide in the end score functions for Altman, Conan Holder model and rating which eventually can be combined into a single model that will forecast the company’s evolution in coming years.

**Key words:** risk assessment of the company, Altman model, Conan-Holder model, expert system, economic analysis

## 1. Introduction

The achievement of goals in activities belonging to any field of knowledge (physics, economics, medicine, chemistry, biology, systems engineering, etc.) requires a certain amount of information / knowledge of the activity, a sequence of decisions and choice between two or more alternatives. In addition, performance in any field of knowledge requires the development of scenarios for the evolution of critical indicators that define a narrow issue (Blagojevic et al., 2011).

On the other hand, systems engineering has recorded an explosive development of intelligent systems technology, which solve complex problems based on human expertise accumulated in the past and following the processes of learning and reasoning which are very similar to biological brain (Micic et al., 2011).

On one hand we discuss about the existence of dozens of distinct areas in which we find major applications of intelligent systems technology (examples of areas such as economics, chemistry, biology, etc.), and on the other hand, we discuss about almost an extreme diversification in global components called “smart technology systems” (Cooper, 2005).

This paper describes the theoretical issues and the applicability of expert systems in metallurgy, especially in the estimation of default risk. Thus, we considered that in real economy, - valid notice for business organizations in România -, there is a problem of great complexity, but rather “narrow”, the problem of

estimating the risk of bankruptcy and predicting the company’s health (SSF) for the following years. It should be noted that on a global scale (U.S., Italy, France etc.) were present during the last two decades, significant concerns in the application of AI techniques to estimate the risk of bankruptcy of companies, but concrete results, as statistical report, were and remain very small (Defillippi, 2006).

## 2. Problem definition

When structuring ES architecture it was taken into account the “n” economic models which can be combined in an ES application, being lately summarized to the use of Altman model, Conan-Holder model and Rating. The rules were established based on the indicators of financial statements using 235 variables for 5 calendar years which resulted after processing them with the inference machine into 53 indicators and 63 rules for each model and calendar year.

Nr	Id.Name	Topic	Val.Calc.	Formula
1	F2	R1	0,275	$R1 = (Ac - Dts) / (Ai + Ac)$
2	F13	r1Lc	2,096	$r1Lc = Ac / Acn$
3	F3	R2	0,032	$R2 = PrNet / (Ai + Ac)$
4	F14	r2pCrC	297,552	$r2pCrC = CrC * 365 / CA$
5	F4	R3	0,042	$R3 = PrBr / (Ai + Ac)$
6	F15	r3Dt	1,711	$r3Dt = (PrBr+Cr)/Dts$
7	F5	R4	2,118	$R4 = Cpr / (Dts + Dtml)$
8	F16	r4PrE	11,91	$r4PrE = PrEx * 100 / CA$
9	F6	R5	0,584	$R5 = CA / (Ai + Ac)$
10	F17	r5PrN	5,423	$r5PrN = PrNet * 100 / CA$
11	F18	r6Sv	211,833	$r6Sv = Cpr * 100 / Dt$
12	F19	r8vCA	56,718	$r8vCA = St * 365 / CA$
13	F7	T1	0,716	$T1 = (Ac - St) / At$
14	F8	T2	0,643	$T2 = Cpm / At$
15	F9	T3	0,06	$T3 = ChF / CA$
16	F10	T4	0,563	$T4 = ChPers / VA$
17	F11	T5	0,421	$T5 = EBE / Dt$
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
52	E12	zCh	0,249	$zCh = 0.16*T1+0.22*T2-0.87*T3-0.10*T4+0.24*T5$
53	E53	vRt	75	$vRt = vRt1+vRt2+vRt3+vRt4+vRt5+vRt6+vRt7+vRt8$

Figure 1. Variables obtained by inference machine after processing the financial statements

The way of validating the proposed ES architecture (developed theoretically) was achieved by steps taken in testing the expert system. In essence, it argues that the whole theoretical construction is functional and leads us to specific results (it is presented the ES module, validation of inference engine etc).

The ES concept provides three functions into a single aggregate score chart for the development of a company in the metallurgical industry in 2005-2009. By following the theoretical principles of conception and design of an ES, the objective is predominantly technical / functional (Pentiuc, 2000); testing the concept of expert system we should confirm / deny to what extent the assumptions from which we started the theoretical developments and other similar issues that are raised is or is not substantiated.

### 3. Description of work procedure

In terms of software, the application comprises the following elements: systems editor for creating, updating all financial statements of the metallurgical company, generator expressions and formulas, inference engine, Visual Fox Pro interpreter that takes from the inference engine the text program (with a rule or formula) and it starts running.

The functional diagram of the system remains subscribed to an open system that includes feedback relationship between outputs and inputs at a later time (to put it differently, the relationship inputs - transformation process - outputs is fully manifested in the architecture of the proposed concept). The functional diagram below is in full correspondence with the general architecture of an ES (Giarratano, 2005).

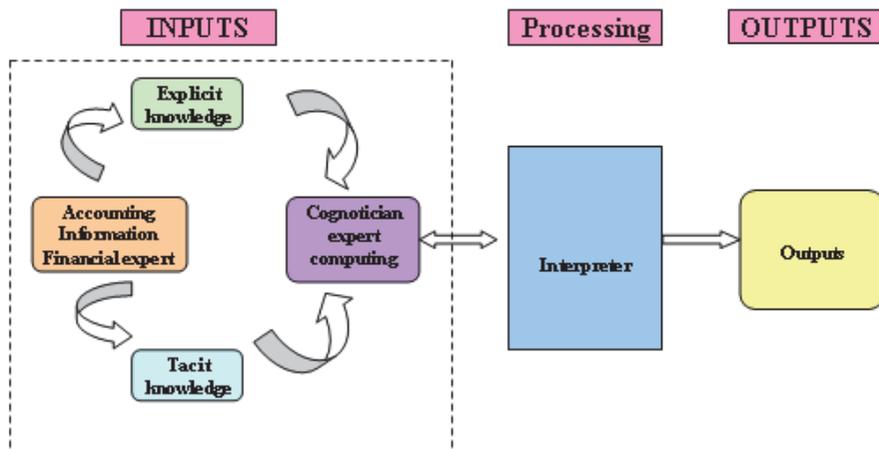


Figure 2. Operating scheme of the ES

Source: Iancu E. – *Sisteme expert în contabilitate si informatica de gestiune*, Ed. Politehnica, Timisoara, 2011

What makes the expert system stand out is the fact that it is trying to “aggregate” or “mix” several models known in economic theory as a new computer model based on tacit knowledge and explicit knowledge.

According to the research carried out, the expert system integrates two broad technologies, namely the database and expert systems.

The innovations brought by this expert system are: the development of an expert system architecture using two ways of representing and processing knowledge (tacit knowledge and explicit knowledge); the generation of expressions and formulas to be used by the inference engine to define production rules; the formulas and rules are developed overall, for each year worked, and the facts are adapted to the expert’s option to the previous step (the values of the year chosen before launching the inference engine are restored in the memory); the engine inference is based on production rules using types of knowledge mentioned above; the identification of the evolution of financial indicators in the economic entity, using models Altman, Conan-Holder and Rating; the possibility to import information from standardized application provided by company for processing data for a certain period of time; it offers a choice to opt for processing calendar years, but shorter periods (quarterly or yearly, on request) or longer periods too (in our case the period between 2005-2009); conducting a comparative analysis of models used to analyze statistical indicators.

#### 4. Results

The three results obtained by the inference engine is the essential objective of user business practice. Estimating the default risk associated with a company has always been and remains a highly complex problem, being given the large number of random factors that can influence the

course of the company’s life (economic situation, various crises, market conditions, technological developments, changes in income, bankruptcy of a major customer, etc.). Although each of the three models is based solely on information from accounting, the display for each Altman, Conan-Holder and Rating model, becomes invaluable aid to top management.

The three major results provided by the inference engine are:

RZ1: Altman score function associated with the model in graphic expression:

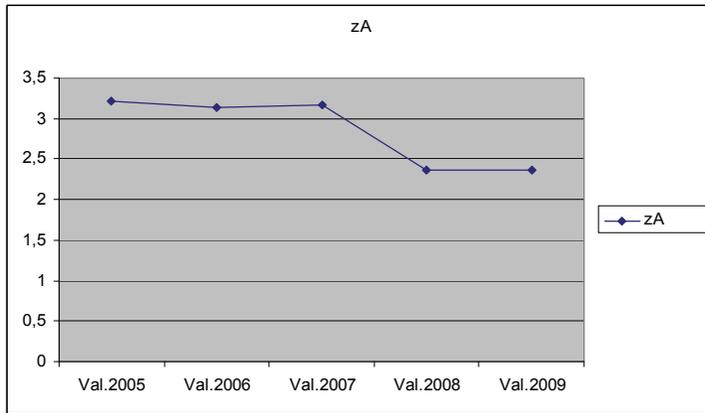


Figure 3. The score function associated with the Altman model for 2005-2009  
 RZ2: The score function associated with the Conan-Holder model

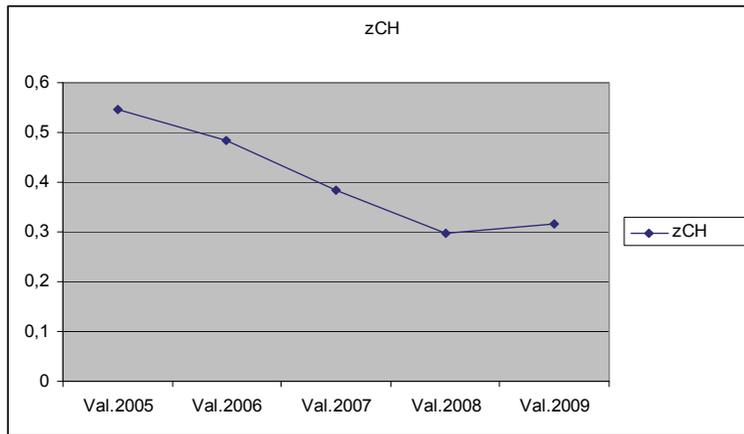


Figure 4. The score function associated with the Conan-Holder model for 2005-2009  
 RZ3: The score function associated with the Rating model

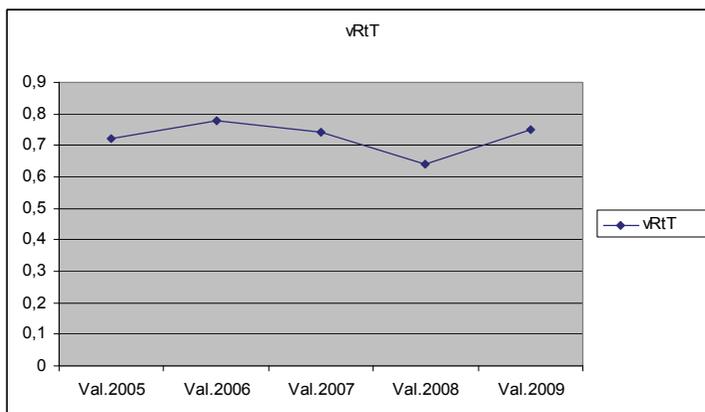


Figure 5. The score function associated with the Rating model for 2005-2009

Obviously, the three score functions known under the form of RZ1, RZ2, RZ3 may be included in a single graphical structure as shown in Figure 6; it can be assumed that we finally came to a synthetic structure that puts in a comparative method three distinct score functions specific to the three economic models.

From the company's management perspective this graphic form of the results offered by the inference engine (expert system), has a major role because, on this

basis, it can be predicted the company's future for the next years. Moreover, if the system enables work with what we called "temporary models", in respect of continuous updating, including quarterly accounting information taken from financial statements the top management will have an informatic tool on which it will correct "on the fly" the company's business cycle.

Below are the synthetic results offered by the inference engine, as shown in Fig. 7.

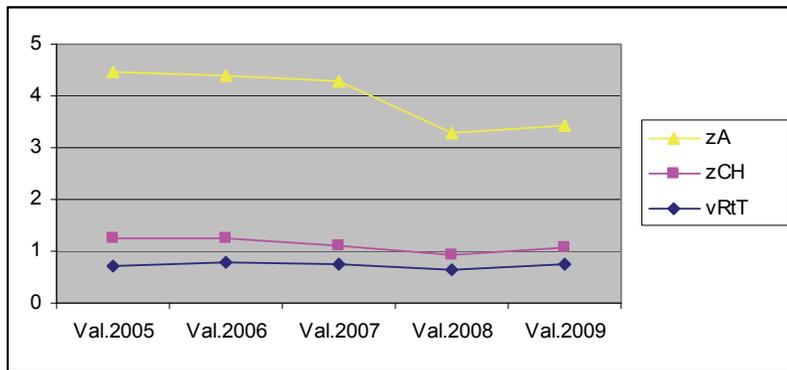


Figure 6. The Evolution of scores for the three models

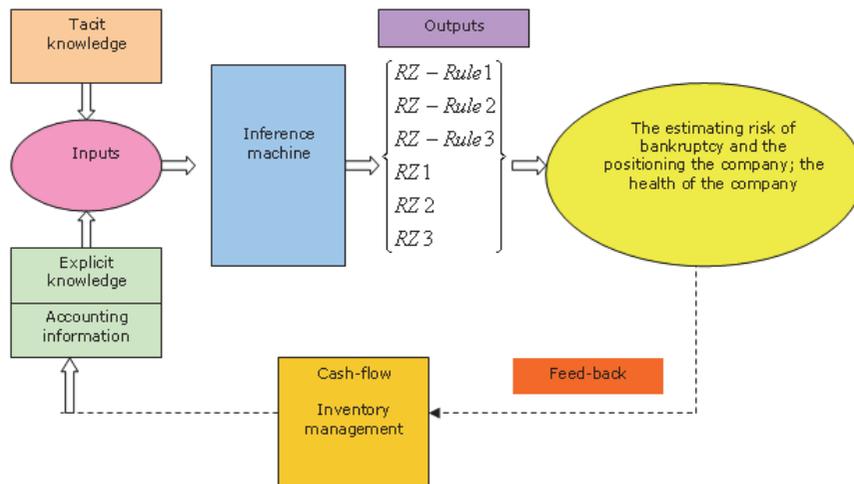


Figure 7. Overview of the results of the inference engine

Source: Iancu E. – *Sisteme expert în contabilitate și informatică de gestiune*, Ed. Politehnica, Timisoara, 2011

The expert system was tested on SC Alro SA company (<http://www.alro.ro/rapoarte>) listed on the stock exchange.

The financial statements of this company were taken from 2005-2009. The evolution of the company is given by the three models that have been processed by the inference machine.

By combining the three models it can be noticed that Conan-Holder and rating model have the closest values due to the fact that they use the same economic and financial indicators.

The Altman model uses other financial indicators and thus the graphic is different.

From the analysis of the three models is observed the Alro company's trend and the measures to be taken by the company's management in the coming years.

## 5. Conclusions

Considering the economic parameters that define the current results of the expert system, there are three distinct ways in which it can be foreseen additional applications of developing the functionality of the proposed system:

a) attaching an additional module to an ES, module designed for operative management company's cash flow analysis;

b) it can be easily adapted to any other company in the metallurgical industry, in other listed companies and other business organizations from various sectors of national economy (the major restriction is only referred to the company's size and organization of accounting reported to IAS, IFRS and accounting legislation). So, without need of significant technical changes, the expert system can combine the Altman, Conan/Holder and Rating model based on existing accounting information in the accounts of these companies is comparable to that metallurgical companies.

c) a complete financial and economic analysis on the health of the company and its positioning on the business cycle taking into account equal or bigger companies than the metallurgical one that have accounting organized after similar accounting principles. The complete financial analysis takes into account an economic problem of great complexity, problem that has preoccupied and still preoccupies the theory of "economics" on a global scale over the last century or more.

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# A Study of Relationships between Religious Tourists' Destination Image, Motivations, and Behavioral Intention

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## Abstract

In the history of human development, religion has played an important part in shaping the nature of economy, politics, and daily lives of people. Religion also has a great influence on some aspects of people's traveling behavior, which is known as religious tourism or pilgrimage. Pilgrimage is one of the motives that push people to travel and the behavior can be traced back to ancient times. Nowadays, pilgrimage travel behavior has become one of the most popular forms of tourism. Despite the booming of religious tourism and the secularization of religion, very few studies have been done to address the phenomenon in Taiwan. Therefore, this study used Hsin Kang Feng Tian Temple as a case to study people's tourism behavior in a religious site. The study was able to collect 350 valid responses and the results indicate: (1) people's socio-demographic characteristics affect their perceived destination image, (2) people's perceived destination image affects their traveling motives, and (3) traveling motives positively affect future intentions.

**Key words:** Religious tourism, Pilgrimage

## 1. Introduction

Religious tourism is one of the oldest forms of tourism and can be found in numerous religions [1]. A sacred site holds certain religious meanings to the believers and acts as a strong pull force that attracts them to make the trip. Therefore, it is logical to study religious tourists' behavior by using the concept of destination image and tourism motivation.

Destination marketing is one of the tools used for destination promotion, which utilizes the resources in the destination to build a unique image of the place [2]. Image is not as literal as a photo of a place, but a subjective perception of a place [3, 4]. Fakeye and Crompton [5] assert that a complex image is formed after tourists interact with a place, which consequently affect their purchase decision and revisit intention. This means that destination image is an integral part that helps to understand tourists' behaviors [6].

Pilgrimage tourism is one form of religious tourism and is currently very popular in Taiwan. The parade of Mazu, a goddess worshiped by most Taiwanese, attracts hundreds of thousands of worshippers to attend every March on her birthday. Therefore, this study used Hsin Kang Feng Tian Temple as a case to study people's tourism behavior in a religious site.

## 2. Literature Review

Lefevre [7] defines religious tourism as visiting to a spiritual sites and using associated services, which can be motivated by both secular and religious reasons. Barber [8] restricts the definition to target visitors with religious motives specifically. Cohen [9] argues that pilgrims and tourists are inherently different for the former is driven by faith to participate in a religious activity and the later may be joining for non-religious motives. Although the distinction between pilgrims and tourists is important, this study adopts the wider definition to understand the increasing trend of religious secularization and to get a holistic view of religious tourism phenomenon.

Since the study postulated that tourists' destination image and motivation affect their behaviors, specifically visiting intention, it is necessary to discuss literatures pertaining to these concepts. Boulding [10] is probably the first to introduce the concept of "image", which was later adopted by Hunt [11] in the study of tourism destination and its development. Other researchers [12] assert that destination image can be categorized into both cognitive and affective components, which are the sum of beliefs, ideas, and impressions that people have of a place or destination. Furthermore, the formation of an image can be divided into three stages, conceptualized as evolving from an organic image (tourists' own mental image of the place accumulated from their own research), through an induced image (organic image manipulated by the marketing campaign of a place), to a complex image (image formed after the visit) [5].

Motivation is believed to be associated with the psychological need to achieve certain goal [13]. Researchers generally accept the dichotomized classification of motivation into push and pull factors [14]. The push factor refers to motives that are intrinsic to an individual, which can be further categorized into five components: knowledge, prestige, enhancement of human relationship, relaxation, and novelty. The pull factor, on the other hand, refers to site specific attributes, which include seven components: hi-tech, expenditure, facilities and events, sightseeing variety, accessibilities, culture link and background, and service attitude and quality [15]. The idea is that people are pushed by the desire to accomplish certain goal and pulled to visit a specific destination that can satisfy that goal. Therefore, it is important to examine tourists' behaviors from both push and pull perspectives to gain a holistic view [16].

Through the discussion of destination image and motivation above, the process of tourists' decision-making becomes clear. Different individuals are motivated by different reasons to plan a trip, which leads to the search for an appropriate destination. Destination image is, therefore, interpreted differently by different individuals and helps to form the choice [17].

## 3. Methods

Based on the above discussion, the proposed research model is illustrated in Figure 1.

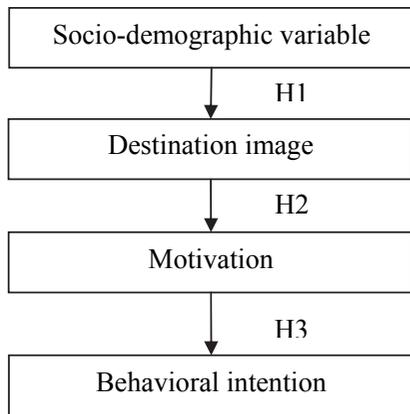


Figure 1. The Research Model

The corresponding hypotheses are:

- H1. Individuals with different socio-demographic backgrounds perceive destination image differently.
- H2. Destination image positively affects motivation.
- H3. Motivation positively affects behavioral intention.

The chosen study site is Hsin Kang Feng Tian Temple. Hsin Kang is a traditional village in Taiwan. Most Taiwanese associate it with Mazu, Feng Tian Temple, and local snacks. According to the statistics released by the Taiwan Tourism Bureau [18], Feng Tian Temple hosted 9,960,000 visitors during 2011, ranking the most popular religious site of that year. The sheer number of visitors makes Hsin Kang Feng Tian Temple an ideal subject for the study. The survey was commenced during March to April, 2011, when the number of visitors reached its peak. The survey targeted respondents who were over 18 years old with convenient sampling method. A total of 350 responses were generated.

#### 4. Discussion and Conclusion

The sample consisted of 174 males and 176 females. Respondents are generally between 36-50 years old, which accounts for 42.6% of the sample. Approximately 140 respondents have a high school or college degree. The monthly salary of the respondents is relatively low with 125 respondents earning less than NT\$ 20,000 (approximately \$690) and 175 respondents earning between NT\$ 20,001~40,000 (approximately \$690~1378). Taoism is the predominating religion with Buddhism next to it. A substantial number of respondents retain both Taoism and Buddhism beliefs, which is consistent with the past study regarding Taiwanese religion distribution [19]. The most popular information channel about Hsin Kang is TV advertising (34.9%), followed by paper (29.7%), and then word of mouth (19.4%).

The three items regarding the religious aspect of image all garnered means higher than 4 (3=mid-point), indicating that respondents agree on the religious value of the place. As to the items about the tourism aspect of image, “rich historical sites” (mean=4.21) received the highest mean, followed by “unique local snacks” (mean=3.97) and “famous local products” (mean=4.00). Therefore, the study can conclude that respondents’ destination image of Hsin Kang is three-fold: (1) religion, (2) historical, and (3) local foods.

In order to test hypothesis H1, the study used ANOVA to examine the effect of socio-demographic variables on destination image. Table 1 illustrates how age differences affect destination image perception. The result indicates that in three out of six items, age possesses significant impact on destination image perception. Although three of the items are not statistically significant, a trend can be observed. Respondents aged under or equal to 20 years old and over or equal to 51 years old are more likely to show higher destination image than respondents between 21-50 years old. Younger respondents are particularly fond of local snacks. Older respondents, on the other hand, tend to favor parades and the Feng Tian Temple. By means of ANOVA tests, the study found that education level and monthly salary have moderate influence on destination image perception. Furthermore, information channel is also a significant predictor for destination image. The result in Table 2 shows that “tourism brochure” and “word of mouth” are the most effective information channels. Respondents who utilize these two channels tend to show higher levels of destination image.

From the above analysis, the study is able to conclude that age and information channel are the most effective predictors of the respondents’ destination image, and therefore hypothesis H1 was slightly modified.

Hypotheses H2 and H3 were tested with Pearson correlation analysis. The result in Table 3 shows that religious aspect of image is strongly correlated with two types of motives, and tourism aspect of image is strongly correlated with all motives except social motive. Two important findings need to be noted. First, respondents who view Hsin Kang as a religious place are only motivated by religious and relaxation motives. Second, curiosity is the strongest motive for respondents with high tourism image to visit Hsin Kang. Religious image appears to have negative correlation with curiosity motive, albeit not statistically significant. The result indicates that respondents with different motives tend to view Hsin Kang with different image.

The result of hypothesis H3 is shown in Table 4. The result indicates that religious-related motives are the strongest contributors to behavioral intentions. Festival is also important in convincing visitors to stay longer and recommend the place to others.

Based on the above analyses, the hypotheses were modified into the following:

- H1. Age and information channel strongly affect individuals' perceived destination image.
- H2. Respondents with different destination images tend to possess different visiting motivation.
- H3. Religious motives are the strongest contributor to behavioral intention.

Based on the findings, following recommendations are made: (1) tourism brochure is an effective information channel, (2) Hsin Kang is perceived as both religious and tourism destination by the respondents, (3) religious motive remains the strongest contributor to behavioral intention, and (4) festivals can convince visitors to stay longer.

The result of the study suggests the multi-facet nature of a destination. In the case of Hsin Kang, one can see that it is both perceived as religious site and a tourism destination. However, religious and festival motives remain the only valid determinants for respondents' behavioral intention. This potentially suggests that Hsin Kang requires more tourism-related activities and facilities to encourage future visitation.

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