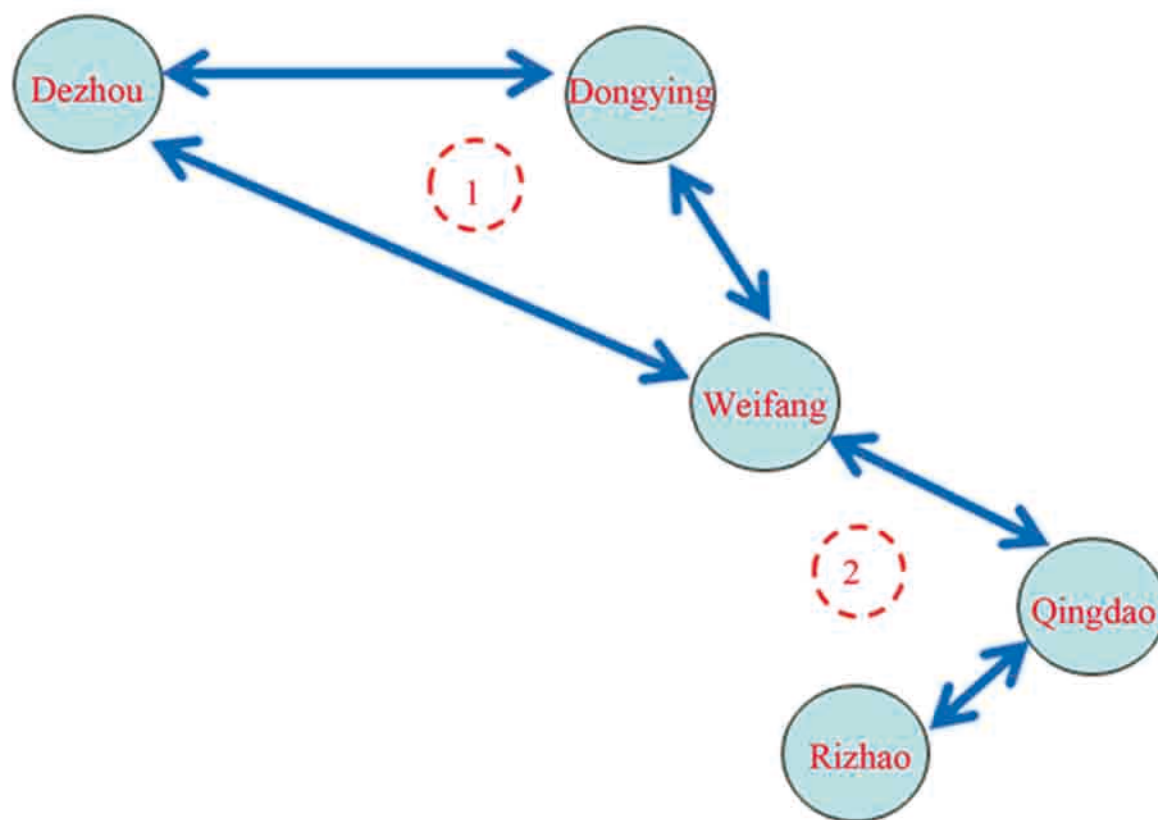




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The Conceptual Model of Influencing Factors and Influencing Mechanism on Team Decision-Making Quality Mediated by Information Sharing

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ABSTRACT

Searching for the influencing factors on team decision-making quality is the hot issue in academic circles and business circles. Based on summarizing the main influencing factors on team decision-making quality, this thesis divides the main influencing factors into team composition factors and team process factors and researches the internal relationship between them. Targeted at the field decision making, this thesis analyzes the influencing process of the main factors on decision-making quality, and constructs the conceptual model of “influencing factors-information sharing-decision-making quality”. This model not only combines the main influencing factors correctly, but also exposes the “black box” between the influencing factors and decision-making quality in field decision making, which can make up for no relative research for the field decision making in the previous studies.

Keywords: Decision-Making Quality; Composition Factors; Process Factors; Information Sharing

1. Introduction

Studies of team decision-making originated from the researches of a small group in traditional social psychology. As more and more organization structures are formed by teams, the studies on team decision-making by industrial and organizational psychologists are more and more widely [1]. Lots of scholars researched the influencing factors on team decision-making from different viewpoints and got abundant achievements, such as the leadership's desire of power, team cohesion, individual levels of team members, team size, discuss form, team conflict, team communication and so on [2,3]. However, most of the scholars only investigated the effects of one or two factors on decision-making quality through empirical methods. There has been a lack of systematical review and classification in the main influencing factors, and a lack of researches on the internal relationship between the main factors.

When researching the influencing mechanism of the main factors on team decision-making performance, scholars usually selected mediators from the paths of information communication and emotional response,

such as team transactive memory, task reflexivity, team mental model, team cohesion and so on [4]. But all these mediators need the long time to accumulate, not suitable for field decision making. Up to now, there is little research on mediators for field decision making and relative analysis.

In view of above problems in the studies of team decision making, this thesis: 1) tries to summarize the influencing factors on decision-making quality and divide the main influencing factors into team composition factors and team process factors, and researches the internal relationship between them; 2) researches the influencing mechanism of the main factors on decision-making quality during the process of field decision making, and constructs the conceptual model of “influencing factors-information sharing-decision-making quality” (see **Figure 1**). This model not only combines the main influencing factors correctly, but also exposes the “black box” between the influencing factors and decision-making quality in field decision making, which can make up for no relative research for the field decision making in the previous studies and provide a new interpretation for the influencing factors how to effect the team decision-

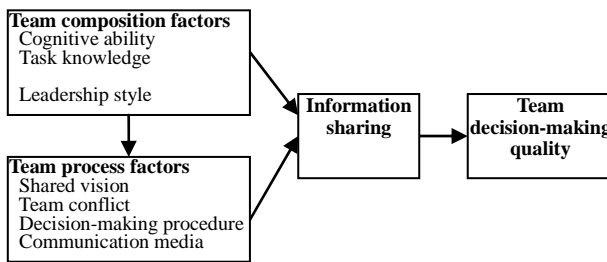


Figure 1. Conceptual model of influencing factors and influencing mechanism on team decision-making quality.

making quality.

2. Information Sharing and Team Decision-Making Quality

The team decision making was an “information exchanging project” for completing a task [5]. The characteristic of team field decision making is focusing on field communication and it makes different information sharing very important. Owing to the different status and responsibility in team, each team member will get different kinds of information. The information includes the common information that is known by all the members, and unique information that is only known by individual member. When team members sharing all information he knows with others, especially the unique information, all members will understand the task contents and aims deeply, and the quality of final decision will be improved. So, whether the information related with decision can be got smoothly and used effectively will influence the team decision-making quality directly.

In the “Information Sampling Mode”, the sampling information was classified as shared information and unshared information. In the subsequent studies, Stasser proved the roles of unique information sharing on team decision making repeatedly. Stasser & Stewart researched the unique information sharing time accounting for the proportion of the discussion time, and found the proportion was positively correlated with decision-making quality [3]. In 1998, Stewart & Stasser introduced another testing method, separating the unique information mentioned at least once from all information mentioned at least once, and found in this method, the positive correlation of unique information sharing and decision-making quality was more remarkable [6]. Lu *et al.* made a meta-analysis of 21 studies, and considered whether the times of unique information mentioned or the times of unique information discussed was positive correlated with decision-making quality [7].

H1: Unique information sharing is positively correlated with team decision-making quality.

3. Relationship of Team Composition Factors, Information Sharing and Team Decision-Making Quality

Team composition factors refer to the factors that determined in the early days of the team, mainly including individual level of team members and leadership style. The individual level of team members includes the task knowledge got by the team members, their cognitive ability and so on. The leadership style can be usually divided into autocratic leadership and democratic leadership.

3.1. Individual Level of Team Members

As the input variable of team effectiveness, individual level of team members has been researched more than 50 years, lots of scholars thought the cognitive ability and task knowledge were the most important factors to forecast the individual job performance, and also the key resources of teams [8]. Zarnoth & Snizek found the higher the cognitive ability of individual was, the higher the team decision-making quality was [9]. Ellis thought the task knowledge got by the important team members had a great effect on the improvement of decision-making quality and performance [10].

H2a: Cognitive ability and task knowledge of team members are positively correlated with team decision-making quality.

Dennis J.D. considered that cognitive ability and task knowledge might influenced the information exchange in team at least two aspects [11]. High cognitive ability and task knowledge could help the members to do better personal recommendation on the basis of limited information, and also could help the members to strengthen the awareness of needing the important task information. These two aspects both could encourage more unique information sharing directly or indirectly. Harrison & Pelletier thought through empirical study, that cognitive ability and task knowledge of team members could help team members to discuss the relevant information comprehensively from various perspectives [12]. The different views to strategy would provide a useful platform for members to discuss during the decision-making process [13].

H2b: Cognitive ability and task knowledge of team members are positively correlated with unique information sharing.

Combined with H1, we can establish the relationship of individual level of team members, information sharing and team decision-making quality.

H2c: Cognitive ability and task knowledge of team members have positive effects on team decision-making quality through the mediator of unique information sharing.

3.2. Leadership Style

In the teams, leadership is an important and natural behavior, and has a prominent role on boosting problem solution, controlling orientation and time, esteeming opinion of team members and arousing team members' enthusiasm. Typical leadership could be classified as autocratic leadership or democratic leadership [14]. Autocratic leadership controlled team discussion, communication and task fulfillment; but democratic leadership promoted team discussion, and encouraged members to involve in the goal-setting process and fulfill the task [15]. In the team discussion, different leadership styles would have different effects on discussing process and final decision-making quality. Autocratic leadership didn't encourage team members to discuss, and the leader would express his opinions at the beginning of the decision-making process to govern others' choice. No discussion would have a bad effect on the decision-making quality and acceptance to decision. On the contrary, democratic leadership would give all members opportunity to express their opinions and make the decision based on the good communication. Thus, the decision-making quality and acceptance to the decision would be improved.

H3a: Democratic leadership can improve the team decision-making quality more than autocratic leadership.

During the team decision-making process, obtaining and using information were mainly completed through team discussion, and the team discussion was controlled and guided by the leader directly. So, the leadership style had a direct effect on information processing. Autocratic leadership style would make the leader's opinions and views on others' choice, and largely inhibit information communicating and processing, especially hinder the unique information sharing. On the contrary, democratic leadership style would encourage team members to speak their minds freely, improve the common and unique information mining and acceptance, and increase the utilization of information [16].

H3b: Democratic leadership can increase unique information sharing more than autocratic leadership. .

Combined with H1, we can establish the relationship of team leadership style, information sharing and team decision-making quality.

H3c: Democratic leadership can improves the team decision-making quality through the mediator of unique information sharing more than autocratic leadership.

4. Relationship of Team Process Factors, Information Sharing and Team Decision-Making Quality

Team process factors refer to the factors appeared and existed during the decision-making process, mainly in-

cluding team shared vision, conflict, communication and so on.

4.1. Shared Vision

Shared vision is the core of team cooperation. It can make the members to interpret the task expectation accurately, and make the members' action to coordinate and adapt with other members' requirement. Only when the team members accepted the team developing orientation, they would cooperate and communicate with each other [17]. On the one hand, shared vision could contribute to task allocation among members and forming specialization. The higher degree of specialization and learning ability of team members were, the higher decision-making quality was. On the other hand, shared vision could increase the team cohesion, strengthen the coordination of individual's target and team target, and promote close cooperation of team members. The two roles could both improve the team decision-making quality and acceptance to decision [18].

H4a: Shared vision of team members is positively correlated with team decision-making quality.

Shared vision could improve the team members' energy, commitment and targets, and provide an orientation for members to communicate. It could increase information sharing among the team members, and contribute to high quality and professional information during the decision-making process. Under the direction of shared vision, task allocation would be more clear, which not only urged team members to dig for the unique information related to task, but also improve the quality of information during the decision-making process. Shared vision had an important role on team information processing ability.

H4b: Shared vision of team members is positively correlated with unique information sharing.

Combined with H1, we can establish the relationship of shared vision, information sharing and team decision-making quality.

H4c: Shared vision of team members has a positive effect on team decision-making quality through the mediator of unique information sharing.

4.2. Team Conflict

Team conflict could be divided into task conflict and relationship conflict [19]. Task conflict refers to the cognitive difference owing to the different views of task; relationship conflict refers to the pressure and frustration owing to individual difference, including more emotional factors [20]. Scholars usually considered that task conflict could largely promote team members to exchange the information and knowledge related to task and inspire

new ideas, and it could also clear up some misunderstanding to enhance the recognition and understanding of task through communication. In a word, task conflict could improve the decision-making quality and team members' work performance [21,22]. However, Relationship conflict could evoke team members' negative emotions, such as, angry, tension, anxiety, pressure and frustration, and would make the working satisfaction declined and motivation lacked. Finally, relationship conflict would lead to team decision-making quality declined [22,23].

H5a: Task conflict is positively correlated with team decision-making quality.

H5b: Relationship conflict is negatively correlated with team decision-making quality.

In the decision-making teams, task conflict had the potential to increase the unique information sharing in that advocated of opposing viewpoints will be called on to describe and justify their positions [24]. In the meta-analysis, two methods for inducing task conflict that had received a fair amount of empirical attention were "Dialectical inquiry" and "Devil's advocacy" [25]. Both methods attempted to foster task conflict in decision-making teams by forcing members to question assumptions and confront minority positions. Several studies suggested these methods could lead to effective unique information sharing in teams [26]. However, relationship would evoke the negative emotions of members, and lead team members to battle over the parochial views of individuals or coalitions rather than consolidating the set of information available into a more complex but accurate whole. In other words, relationship conflict might prevent teams from effectively incorporating the unique information [20].

H5c: Task conflict is positively correlated with unique information sharing.

H5d: Relationship conflict is negatively correlated with unique information sharing.

Combined with H1, we can establish the relationship of team conflict, information sharing and team decision-making quality.

H5e: Task conflict has a positive effect on team decision-making quality through the mediator of unique information sharing.

H5f: Relationship conflict has a negative effect on team decision-making quality through the mediator of unique information sharing.

4.3. Decision-Making Method

Timmermans divided the team decision-making procedure into MAU (multi-attribute utility) decision support and unstructured discussion [27]. MAU model was widely used in decision support, and it supplied a framework of

decision problems and a logic order of decision. MAU integrated the interaction of team members as a whole, reduced the negative emotions of group dynamics (e.g.: the dominant position of one or more members in discussing process; low tolerance for the minority view) and improved team decision-making performance. Timmermans studied how MAU effected decision-making quality and found MAU had a remarkable effect on subjects' preference and team consensus, and also had a good effect on members' satisfaction to decision-making process [27].

H6a: MAU decision support can increase team decision-making quality more than unstructured discussion.

MAU model provided an analysis support to assess the merits of each alternative and made the members' preference and the inconsistency clear, and it improved the different information sharing and exchanging in teams [28]. MAU required all team members to discuss all information and express their viewpoints and could dig for and utilize more unique information than unstructured discussion.

H6b: MAU decision support can increase unique information sharing more than unstructured discussion.

Combined with H1, we can establish the relationship of team decision-making method, information sharing and team decision-making quality.

H6c: MAU decision support can increase team decision-making quality through the mediator of unique information sharing more than unstructured discussion.

4.4. Communication Media

With the development of computers and network, many scholars began to learn the effect of communication media on team decision-making quality. Scholars compared the decision-making difference under the conditions of CMC and FTF, but the results were different. Some scholars considered that CMC could increase the decision-making quality more than FTF. Because under the condition of FTF, the opinions of experts of higher status could become the mainstream, the other members just participated passively. So, it would lead to groupthink. But under the condition of CMC, owing to lacking of social context clues, members would be more equal. Thus, the teams would generate more thoughts and ideas. Rock & Ayman thought without the interference of non-language information, members would focus on the information processing during the discussion [29]. So, CMC could pre-determinate the successful decision better than FTF. However, some scholars got the opposite conclusions. Hightower & Sayssed found under the condition of CMC, members would discuss more common information rather than unique information, and owing to lacking of non-language information, communication

and task fulfillment under CMC was more difficult than under FTF [30]. This thesis is inclined to choose the first opinion.

H7a: CMC can increase team decision-making quality more than FTF.

Some scholars thought under the condition of CMC, members might share their unique information at the same time, and would avoid the situation that some members occupied much discussing time to hamper other members to express views or influence the thought of other members [31]. Equal status of members under CMC would be better for members to participate discussion actively and share their common and unique information.

H7b: CMC can increase unique information sharing more than FTF.

Combined with H1, we can establish the relationship of communication media, information sharing and team decision-making quality.

H7c: CMC can increase team decision-making quality through the mediator of unique information sharing more than FTF.

5. The Internal Relationship between Team Composition Factors and Process Factors

The above analyze and summary the influencing mechanism of team composition factors and team process factors on decision-making quality. In fact, team composition factors not only can influence the final decision-making quality directly, but also can influence the decision-making quality indirectly through team process factors. So, paying more attention to the effects of team composition factors on team process factors usually is very important to final decision-making quality.

Mohammed & Ringseis found during the team interactive process, cognitive difference related to task had a direct effect on conflict [32]. Cronin & Weingart put forward “conflict based on mental representation gap”, and pointed out in their research that function diversification would increase members’ cognitive difference and would lead to members’ interpretation to the necessary information different [33]. Members’ mental representation gap was the source of conflict. Hambrick, Cho & Chen certificated through empirical research that cognitive difference would benefit for mobilizing the member to solve the task from multi-viewpoints and stimulate the task conflict [34].

H8: Team members’ cognitive difference is positively correlated with task conflict.

Compared with autocratic leadership, democratic leadership could benefit for encouraging team members to express their different opinions related to task, and forming the mechanism of free expression of doubt in teams.

On the other hand, democratic leadership also could benefit for establishing a harmonious atmosphere in teams and reducing the negative effect of conflict. Lovelace, Shapiro & Weingart certificated in their study that democratic leadership could encourage team members express the doubt related to task freely, resolve violent conflicts in time, and play an active role in the team members interaction [35].

H9a: Democratic leadership can increase team task conflict more than autocratic leadership.

H9b: Democratic leadership can reduce team relationship conflict more than autocratic leadership.

There were two basic ways to establish shared vision: one was through the active initiative of leaders and acceptance of team members, the other was through the collection of team members’ visions. No matter what kind of way, leadership had an important role on establishing shared vision. During the process of establishing shared vision, the opinions of members might be different. So, the leaders should keep touch with team members at any time, and help members rather than control them. Refining and publicity for shared vision should be established on the basis of freedom, sincerity and communication. So, democratic leadership makes it easier for members to accept shared vision.

H10: Democratic leadership can push shared vision ahead easier than autocratic leadership.

6. Conclusion and Limits

This thesis puts forward the conceptual model of team composition factors, team process factors, unique information sharing and team decision-making quality, and infers that team composition factors of individual level, leadership style and team process factors of shared vision, team conflicts, decision-making methods, and communication media influence decision-making quality through the mediator of unique information sharing. This model includes many major influence factors on decision-making quality, exposes the “black box” between the influencing factors and decision-making quality during the field decision making, and analyzes deeply the role of unique information sharing between influencing factors and decision-making quality. This research will give decision makers some suggestion and reference of how to increase decision-making quality.

6.1. Strengthen Information Sharing in Teams and Encourage Team Members to Communicate and Think about the Unique Information

During the field decision making, the most important factor of high quality decisions was the information

sharing and communication in the field. Exchange and integration of different information could not only improve the individual bias and asymmetric information, but also stimulate the new ideas effectively. But in reality, owing to the biased sampling, team members usually discussed the shared information rather than the unique information, and it made teams of many experts not to produce high quality decision. Therefore, how to strengthen unique information sharing and communicating is most important. Changing composition factors and strengthening process factors can stimulate the unique information sharing in part.

6.2. Pay Enough Attention to Team Composition Factors as Much as Team Process Factors

Previous studies under IPO frame considered that team process factors were the main influencing factors on team performance, and ignored the effect of team composition factors. However, recent studies certificated that composition factors not only can influence the unique information sharing and final decision-making quality directly, but also can influence the decision-making quality indirectly through team process factors. So, we should think about the different roles of team composition factors and team process factors and the internal relationship between them, and not favor one or discriminate against the other.

The model of “influencing factors—information sharing—team decision-making quality” mainly thinks about the internal conditions of teams, and does not consider the external conditions of teams. In fact, under the different external conditions, the influential way of each kind of influencing factors would be different. In the future studies, we should research the influence of team composition factors and team process factors on decision-making quality combined with the external dynamic environment.

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Public Perception and Attitude towards Value Added Tax (VAT) in Nigeria

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ABSTRACT

This study assesses the level of tax education, particularly the level of understanding of VAT law amongst three categories of taxpayers in Nigeria. The data for the study were collected by means of structured questionnaires administered to the respondents. The analysis of results showed that most of the respondents have poor knowledge of VAT law in Nigeria, irrespective of their level of literacy, and that there was no significant difference in the amount of knowledge of VAT law amongst the three groups of respondents used for the study. A suggestion was made of an aggressive and widespread public education on VAT matters that could involve an integration of tax education into the curricula of education in our institutions of higher learning and general public enlightenment through media, and organized workshops for specific groups.

Keywords: VAT; VATable Goods; Tax Education

1. Introduction

Public attitude towards tax matters has often been negative. In the early times, taxation was to a large extent considered as an instrument of oppression wielded by the ruling class over the subjects. Reference [1] observed that the power to impose tax belongs to the government, and could only be curtailed by express constitutional provisions. But as the Government has an inherent right to impose tax on citizens, the citizens also have an inalienable right over their property and would not like to part with such to government, which is often seen as an inanimate, detached and remote entity. It is the constitutional duty of the citizens to pay any tax that might be imposed by Government.

However, no citizen would like to pay any tax voluntarily and that is why Government usually enacts law to back it up. A typical tax law would specify the purpose of the tax, the mode of its administration, scope, offences and associated penalties relating to the tax matters. The essence of the tax law is to assist taxpayers and tax administrators to know what the tax is all about, how it works, who is responsible for its administration as well as the offenders relating to tax matters and associated penalties etc.

Every citizen is required to be conversant with the tax laws in operation. Such knowledge or awareness has the tendency to promote voluntary tax compliance amongst the citizenry. Even for those that operate trans-border transactions, they are equally expected to know, understand and comply with other relevant tax laws of foreign countries, as they affect their business operations. The mere fact that somebody has been educated does not imply that he/she may have sufficient knowledge in tax matters. This may even be true for professionals as well as laymen. Sometimes citizens are trapped by the elegance of this assumption. Therefore, the following questions provide a clear focus for our current study. Do businessmen or professionals or even the laymen really know and understand various tax laws in operations? How much of the tax laws do they know? And does the knowledge of tax laws vary from one group of taxpayers to another? Does general education guarantee taxpayers' understanding of tax laws? Does the taxpayers' knowledge of tax laws influence their activities? How can the differences in taxpayers' knowledge of tax laws help in the planning and implementation of tax laws?

It is in an attempt to provide empirical answers to the above questions and other related issues that this study

was undertaken. Towards this end, the focus of this study is on the recently promulgated tax laws in Nigeria, particularly the Value Added Tax (VAT), which came into operation in 1993.

The objectives of this study are:

- 1) To assess the level of awareness and understanding of VAT by businessmen, professionals and laymen.
- 2) To assess the relative impacts of VAT on the VAT payers and the economy.
- 3) To identify the problems confronting the administration of VAT from the perspective of the respondents.

The two hypotheses formulated for testing in this study are stated below:

- 1) That there are differences in the knowledge of VAT amongst the businessmen, professionals and laymen.
- 2) That there is positive relationship between the level of formal education of a taxpayer and his level of knowledge of VAT law.

2. Theoretical Framework and Review of Literature

Much has been written on Value Added Tax (VAT) since its inception in tax administration worldwide. As per the conceptual meaning of VAT, opinions differ. Reference [2] regards VAT as “a tax levied at each stage of production on the first value added”. Reference [3] on the other hand considers VAT as a multi-stage consumption tax levied on the difference between a firm’s sales and the value of its purchased inputs used in producing goods”. But the most widely accepted but woolly definition is the one provided by the United Kingdom Statement of Standard Accounting Practice (SSAP) Number 5, which states “VAT is a tax on the supply of goods and services, which is eventually borne by the final consumer but collected at each stages of the production and distribution chain” [4].

From these definitions, it is evident that the classical VAT is a consumption tax, its incidence is on the final consumers and it is a multi-state collection tax. The original form of VAT started in Germany in 1919. In 1937, France introduced a form of VAT known as production tax, which has helped replaced with producer’s income-based tax in 1948 and consumption tax in 1954. The French VAT system became a condition precedent of becoming a member of European Economic Community (EEC) under the treaty of Rome in 1957. The European community unanimously adopted VAT in 1967 following the reports of the Neumark and Jansen Committees. Nigeria also adopted VAT in 1993. Many other countries have come to replace sales tax with VAT for certain reasons. VAT is more comprehensive and well equipped for taxing, more equipped to ensure voluntary compliance for its multi-stage collection and credit mechanism through the use of invoices, it also provides a

well-defined audit-trail for tax authorities and thus it is easier to integrate VAT with income tax audit.

VAT has some characteristics, which include neutrality, equity, and regressive nature. VAT is neutral to foreign trade; individual or household choices; individual or household savings and consumption decisions; forms of business ownership; mode of financing and the choice amongst inputs except where the supplies are VAT exempt or zero-rated. The argument on the equity of VAT based on the Hobbies theory of equity, which states that the people should pay tax based on what they withdraw from society’s resources, as measured by consumption, rather than what they contribute to such resources, as measured by income [5]. The equity of VAT is therefore based on the fact that it is a consumption tax. The regressive characteristics of VAT has been argued that it is only in a short run period; say a year that VAT is regressive. However, on life cycle concept VAT burden tends to even out in the long run.

The strategic policy decisions in establishing VAT systems have attracted of tax scholars such as [6]. According to him some of these strategic policy decisions range from the desirability of VAT adoption or otherwise, the form of VAT system to adopt, coverage of VAT system, the government department to be responsible for VAT administration. On the desirability of VAT, two groups exist. There are those countries, which adopted it on a mandatory platform either because it was a condition precedent to becoming a member of a regional grouping, like EEC or because of the linkage with the colonial French master, as Cote d’Ivoire and Senegal. Then there are other countries, which were merely persuaded to adopt VAT systems as a means of enhancing their revenue-base by such international bodies as World Bank, International Monetary Fund (IMF). Examples of which is Nigeria. VAT system has not in any way been attractive in some other countries particularly those with strong pure federation. In these countries, sales tax was doing very well and that each component state is seriously guarding its revenue-base as well as its relative independence more jealously. Examples of such countries include United States of America and Canada. Three methods for calculating VAT have been identified. These are the credit method (the Japanese model) and the addition and subtraction methods respectively. The credit method is the most popular even though it does not define value added. The attractions include easy policing and affordability of good audit trail due to the use of invoicing.

VAT verification has two forms, namely the room (or office) verification and the field verification. The aim of VAT verification is to promote enforcement of tax laws while VAT audit aims at minimizing tax evasion. VAT audit could be simple or in-depth audit. However, an

effective VAT audit requires planning, audit strategies and audit programme, and audit checklist. It has been suggested that VAT audit system should be integrated with the income tax audit; an effective tax audit system enhances the level of the tax compliance. VAT investigation is usually upon the suspicion of criminal tax fraud or tax evasion. Tax fraud has three elements, namely, the action, the consequences and accountability. There are numerous acts, which could amount to tax fraud. These include failure to register, unreported sales or purchases, misuse or use without right of a taxpayer's invoice; and exaggerated refund claims. Others are omission of self-delivers; incorrect description or classification of goods in a multiple rates system, falsification of books, records and other documents and presentation of score as if they are genuine; failure to show or submit books, records and other documents, to failure to pay tax already withheld etc. Any of these categories of persons could be liable for criminal tax fraud: VAT payers, a representative of a firm (such as the director, secretary or a manager) an authorized person (proxy), and an employee of the taxpayer. Penalties exist for various offences of VAT laws. These range from payment of fine (either of specific sum of money or a certain percentage of amounts of tax lost to the governments as a result of the acts of tax evasion) to imprisonment [7].

3. An Overview of VAT Law in Nigeria

VAT was introduced in Nigeria in 1993 to replace the then existing sales tax. Some Unity Party of Nigeria's (UPN) controlled states as a means of enhancing their revenue base to carry out their free education introduced sales tax in Nigeria in 1980-1981 and free health services programmes. Attempt at forestalling State Governments from legislating on tax matters proved abortive at the Lagos State then argued that only income taxation was in the exclusive legislature list and as such any state could legislate on sales, purchase and consumption taxes. This bold move of Lagos State Government prompted many other states in Nigeria to join. Hence by 1986 many states in Nigeria had adopted sales tax through their various states edicts.

The widespread adoption of sales tax by many states lacked harmonious structure with attendant negative implications on inflow of foreign-investment and distribution of industries in Nigeria. The Federal Government came up with Sales Tax Decree Number Seven of 1986 to harmonize the sales tax structure while leaving the implementation in the hands of the states on the basis of residence. In spite of the opposition by the states on the unconstitutionality of the Federal Government action, the latter did not stop in that by 1991 a study group was set up to review the entire tax system in Nigeria. The study group proposed VAT but suggested a modified Value

Added Tax (MVAT) for Nigeria. Sales Tax was finally replaced in 1993 with VAT after promulgation of relevant legislation. Some of the reasons adduced for the replacement of sales tax with VAT include: that sales tax base was too narrow as the Sales Tax Decree targeted only locally manufactured goods and that VAT was capable of yielding high revenue compared to sales tax.

The VAT Decree came into force on 1st December 1993. The Decree was divided into six parts containing 43 sections and three schedules. Part one consisted of six sections, all devoted to definitions of terms. Section five provides guideline on the determination of the values of taxable goods and services, whether supplied for money consideration or non-monetary consideration or imported. Part two considered the Administration and Management of VAT. The Federal Board of Inland Revenue (FBIR) is responsible for the assessment and collection of VAT, registration of taxable persons and for accounting for VAT proceeds [8]. Issue of returns, remittances, recovery and refund of VAT is the subject of part three. It is the duty of the taxable person to take adequate records and accounts of all transactions, and to render returns of all goods and services purchased or supplied during the month on or before the 14th day of the following month. Part four provides for the Value Added Technical Committee. Sections 17 to 20 specified the composition, functions, proceedings and staffing of the committee, which is to provide technical, professional and advisory services on VAT matters to the Board.

Part five provided a list of offences and penalties associated with VAT. The offences range from furnishing false documents with a fine of twice the amount under declared if convicted to failure to submit returns to the Board with a fine ₦5,000 for every month of default. The last part considered miscellaneous issues such as powers of Secretary or Minister of Finance to vary schedules and tax rate, inspection by an authorized officer, distribution of revenue amongst the tiers of government etc.

Reference [9] considered the perception of Nigerian businessmen on Value Added Tax (VAT). The study was carried out in city of Calabar, Cross River State, Nigeria. The types of business covered include distribution, consultancy services, manufacturing, importation, warehousing and advertising. Analysis of the data obtained from questionnaire administration showed that about 66.7 percent of the businessmen involved in the study claimed to be aware of VAT, although their knowledge is rather shallow. Only about 2.2 percent of the sampled businessmen registered for VAT. This probably could amount to high degree of incidence of VAT evasion and the concomitant loss of VAT revenue to government. Quite very few (about 1.7%) of businessmen under study have ever attended business workshops/seminars where informa-

tion and matters about VAT were being discussed. It was concluded that most businessmen in Nigeria are not well educated about VAT matters. VAT was considered as disincentive to most businessmen under study. They argued that most VATable products attract higher prices (because of VAT inclusion) and this is responsible for low sales compared to non-VATable products.

Reference [10] studied the impact of VAT on the economy. It was observed that VAT has the tendency to boost the revenue generating capacity of the economy and thus help the Nigerian economy to be less dependent on petroleum resources. Although VAT has the tendency of increasing the prices of goods and services that are VATable, if the VAT proceeds are channeled to the provision of social infrastructure, the welfare of the citizenry would improve.

Reference [11] examined the administration of Value Added Tax (VAT) in the manufacturing industry in Nigeria. The objectives of the study were to determine the level of compliance and the effects of VAT on the internal operations of the manufacturing organizations. The data for the study were obtained from Bendel Feeds and Flour Mills, Ewu, Edo State. The results of the analysis showed that the company maintained high degree of compliance with the stipulation of VAT Decree. The study revealed that the VAT violates the tax canon of equity. It was argued that the imposition of flat rate of 5% on all organizations is unfair. It was claimed that companies that manufacture products, which are harmful to health such as cigarettes, tobacco and liquor, should be taxed at a higher rate. The flat rate of VAT makes the incidence of burden to be heavier on small companies that are striving to survive compared to the big and successful ones. The major shortcoming of this study is that it is limited in scope as it was limited to only one manufacturing company. We believe that the results could be more interesting if more manufacturing companies across diverse geo-political zones in the country are involved in the study.

Reference [12] examined the problems and prospects of VAT in Nigeria. Questionnaires were administered to the general public, suppliers of VATable goods and services and VAT Directorate of the Federal Inland Revenue Services. The results of the study revealed that majority of the respondents are not aware of VAT and had wrong notion about it. Many did not know VATable goods and services, as the lists are not commonly available. Many small-scale business owners have the habit of not keeping proper books of accounts while some medium-scale business are guilty of under invoicing. Some other problems identified by the study include late remittance of VAT collected, ineffective VAT collection system, poor coverage, fraud and unstable sharing formula. The study disclosed that VAT has really helped to

increase the non-oil revenue locally generated by government. It was concluded that much has to be done in the area of publicity to raise the level of awareness of the public to the desired level.

Reference [13] looked at the understanding of the professional men about provisions and operations of the VAT law in Nigeria. Questionnaires were administered on professional men like Accountants, Lawyers, Medical Doctors, Engineers, Architects and Bankers, to determine how much they know about VAT law. The results of the study showed that most professional men participated in the study claimed that they are aware of VAT law and VAT operation in Nigeria. However, deeper probe into how much of the VAT law they know showed that most of them have shallow knowledge of VAT law. Many have not even seen a copy of VAT law before let alone reading and understanding what the law says in detail.

The few accountants (25%) and lawyers (15%) who demonstrated knowledge of VAT law to some extent happened to be those who practice as tax management consultants. The rest who had no course to deal with VAT law in general have no detailed knowledge of it. Thus, it is practically difficult for them to assess the adequacy or otherwise of the law.

Reference [14] carried out a similar study in 1999. She examined the perception of the tax consultants on the adequacy or otherwise of VAT law in Nigeria. Questionnaires were administered to tax consultants in eight cities in Nigeria, namely, Ibadan, Benin City, Akure, Asaba, Kaduna, Kano, Calabar and Enugu. One of the major objectives of the study was to compare the legal expectations of VAT with what actually obtains in practice. Majority of the tax consultants used for the study (78%) claimed to have read VAT Decree. About 98% of those who claimed to have read VAT decree also said that they understood it. As a test of their knowledge and understanding of VAT they were demanded to outline the contents, the striking issues, and loopholes (if any) in the VAT decree. Unfortunately, over 80% of those who claimed to understand VAT decree could not outline the contents and neither were they able to identify any striking issues nor any loopholes.

Reference [15] examined the impacts of VAT on buying behaviour of consumers of VATable goods in supermarkets in Benin City. The study aimed at determining whether imposition of VAT on goods and services influence the choice of consumers, whether VAT affects consumer's taste and preference, for VATable supermarket goods. Two sets of questionnaires were administered separately to selected consumers of supermarket goods and owners of supermarkets in Benin City. The data obtained were analyzed and the results showed that most of the consumers of supermarket goods are not aware whether they purchased VATable goods or not.

The implication of this is that imposition of VAT on those supermarket goods has no negative effects on consumers' choices as well as their taste and preference. The owners of supermarkets observed that the imposition of VAT makes the costs of VATable supermarket goods more expensive than non-VATable ones and thereby makes sales of VATable supermarket goods less. Owners of supermarkets observed that customers must have resorted to buying those goods that they used to buy from the supermarkets before imposition outside the supermarkets. The implication of this is that consumers are likely prone to buy fake and adulterated goods outside supermarkets because of their cheapness. However, this point cannot be substantiated, as the fact that goods sold in supermarkets need not be superior to similar ones sold outside the supermarkets. This has necessitated the design of an on-going detailed study on the analysis of sales of VATable goods in supermarkets before and after the introduction of VAT in Nigeria (in progress). It is expected the results of this study will throw more light on the impact of VAT on consumers' behaviour in Nigeria.

Reference [16] examined value added tax (VAT) and economic growth of Nigeria. Using time series data on the gross domestic product (GDP), VAT revenue, total tax revenue and total (Federal Government) revenue from 1994 to 2008, the results showed that VAT revenue accounted for about 95% significant variations in GDP in Nigeria. It was observed that VAT revenue was more stable than GDP during the period but no causality existed between the GDP and VAT revenue. It was recommended that all administrative loopholes in the management of VAT matters in Nigeria should be addressed to enable VAT revenue to continue to contribute significantly to the economic growth in Nigeria.

In another related study on the impact of VAT on revenue generation in Nigeria, it was observed that VAT has statistically significant effect on revenue generation in Nigeria. Honest dedication of all agents of VAT for collection and payment improvement in the collection of VAT by government were then advocated [17]. Realizing the significant contribution of VAT on the economic growth in Nigeria, it was recommended that government should sensitize the people to enable it increase the tax rate so as to enlarge its annual revenue for economic development [18].

From the foregoing, it is evident that VAT contributes significantly to the total revenue collectable by governments in Nigeria. In spite of this, there are still problems associated with VAT payment by the public. Should Nigerian government decide to increase VAT rate to enlarge her revenue base because of the effect of VAT revenue on government total revenue? How would the public react? To be able to preempt what would be the public reaction

on such a proposed public policy, it is important to know what is the current public perception and attitude to VAT system in Nigeria. This is the rationale behind this study.

4. Materials and Methods

All taxpayers in Nigeria constitute the target population for this study. However, for comparative analysis we decided to structure the taxpayers into groups, namely, general businessmen, the professionals and others, which we referred to in this study as laymen. The fieldwork for the study was carried out in cities selected from the three geo-political zones in Nigeria to ensure adequate representation of samples to be collected. These are Benin City, Warri, Lagos, Ibadan in the Southwest, Enugu, Aba, and Port Harcourt in the Southeast, and Kaduna and Kano in the North. Using stratified random sampling technique one hundred (100) questionnaires were administered to each of the three categories of taxpayer or strata mentioned above in each city. Thus, a total of three hundred (300) taxpayers were sampled in each city to give a total of 2700 taxpayers, which participated in the study.

Each questionnaire administered consisted of four different sections. The first section elicits general information about the respondents. Such information includes the sex, age, marital status, educational status, occupation and income of the respondents. The second section dwells on the awareness of VAT law amongst taxpayers while the third section considers their understanding of VAT's operation. The last section presents an opportunity for the respondents to consider the impacts of VAT on taxpayers in particular and Nigerian economy in general.

The data obtained from the study were analyzed using descriptive statistical techniques such as the frequency distributions and measures of central tendency. Two hypotheses were formulated for the study. The first hypothesis states that there are differences in the knowledge of VAT amongst the businessmen, professionals and laymen. This hypothesis was tested using chi-square analysis. The second hypothesis states that there is positive relationship between the level of formal education of a taxpayer and his level of knowledge of VAT law. The hypothesis was tested using the Spearman rank correlation analysis. The results of these hypotheses testing are indicated in appropriate sub-section below.

5. Results and Discussion

Out of the total of 2700 taxpayers engaged in the study only 1467 taxpayers responded to our questionnaires. This represents slightly above 54% of the taxpayers. The breakdown of the 1467 taxpayers that participated in this study is presented in **Table 1**.

Table 1. Sex distribution of respondents.

Group	Males		Females		Total	
	No.	%	No.	%	No.	%
Professionals	225	22	198	42	423	29
Businessmen	486	49	90	19	576	39
Laymen	288	29	180	39	468	32
Total	999	100	468	100	1,467	100

Source: Authors (2013).

We observed that many Businessmen (39%) participated in the study compared to the Professional (29%) and Laymen (32%). Similarly, more males (999 males or 68%) responded to our study than women (468 females or 32%). All the respondents were Nigerians. They belonged to different ethnic groups such as Yoruba, Hausa, Igbo, Bini, Urhobo, Afemai, and Isoko. The average age of the Professional group was 31 years. About 63% of these people were married while 37% were single. The professionals included Engineers, University Lecturers, Teachers, Accountants, Bankers, Medical Doctors and Nurses. By virtue of their background they are highly certificated people. The second group included men and women operating their personal businesses. The average age of the people in this group was 40 years. Majority of these people were married (about 60%). Most of them possessed primary or secondary school certificates (78%) while the rest possessed either non-degree post-secondary school certificates (about 10%) or degree post-secondary school certificates (about 2%). The third group consisted the laymen, majority of who are into public service (70%) and about 12% were unemployed. Majority of them had post-secondary school (non-degree) certificates (39%) while the rest either had secondary school certificates (29%) or first-degree certificates (19%) or post-graduate certificates (13%). No stark illiterate person educationally participated in the study.

6. Awareness of VAT and VAT Law

The major assumption of this is that tax compliance depends on the taxpayers' awareness, knowledge and understanding of the applicable tax law. In this study, attempt was made to ascertain the veracity of this assumption. **Table 2** shows the variation in the proportion of respondents who claim to be aware of general issues related to VAT, VAT law, and its operation in Nigeria and those who do claim not to be aware.

From the above it is evident that about 79% (1152) respondents claimed that they are aware of VAT while 21% (315) indicated ignorance or simply refused to respond. More of Businessmen indicated awareness than the Professional and Laymen. More of laymen indicated

lack of awareness relative to other groups. However, only 2% of the professional men, 15% of the businessmen and 6% of the laymen, could provide correct definitive meaning of %'AT. They simply described VAT as a consumption tax payable on goods and services, which were used to replace tax in 1994 (See **Table 3**).

Majorities of the respondents have wrong knowledge of what VAT is all about. **Table 4** summarizes the various ways the respondents have described VAT wrongly.

We observed that most of the respondents (44%) did not know VAT more than simply Value Added Tax. Similarly, small proportion of the professional men (28%), Businessmen (17%) and Laymen (17%) agreed that

Table 2. Awareness of VAT, VAT law and its operation in Nigeria.

Group	Aware		Not aware	
	No.	%	No.	%
Professional	360	31	63	20
Businessmen	468	41	108	34
Laymen	324	28	144	46
Total	1152	100	315	100

Source: Authors (2013).

Table 3. Respondents' knowledgeability of VAT.

Group	Aware		Not aware	
	No.	%	No.	%
Professional	9	2	414	98
Businessmen	90	15	486	85
Laymen	27	6	441	94

Source: Authors (2013).

Table 4. Some ways taxpayers described VAT.

S/No.	Incorrect responses		
1	It is tax charged on consumer products	207	15
2	It is tax paid on goods	162	12
	It is tax paid for consuming luxury goods	99	7
4	It is tax on value, which the supplier adds to goods and services before selling them	216	16
5	It is tax paid for the services received from public utilities	72	6
6	It is simply value added tax	585	44
	Total	1341	100

Source: Authors (2013).

they know the various forms of VAT in practice. However, no one of the respondents could give correct forms of VAT in practice, namely, the consumption, the income and the gross product types of VAT. In fact only insignificant proportion of the professional men (6%), Businessmen (2%) and laymen (almost 6%) could identified Modified Value Added Tax (MVAT) as the form of VAT which is being implemented in Nigeria. Attempt to know whether the respondents really understood the basic difference(s) between sales tax and VAT showed that 1143 respondents (78%) did not know the differences between the sales tax paid and VAT. **Table 5** presents what they considered as basic differences.

Although many of the respondents claimed to know VAT law in Nigeria, only 3% of the professional men could identify the name of the VAT law as VAT Decree Number 103 of 1993. About 48% of professional men, 50% businessmen and about 33% of the laymen correctly identified the agency responsible for the administration of VAT in Nigeria as the Federal Board of Inland Revenue; others referred to the State Government, Federal Government or simply indicated that they did not know. Not many of the respondents (Professional men 6%, Businessmen 2%, and laymen 8%) have seen a copy of VAT Decree before, either from their friends, Libraries, Newspapers, or personal readings whether in the quest to know tax position or personal inquiry or business demanded or professional examination requirement.

7. Taxpayers Understanding of VAT Law

We observed that the same professional men (6%) claimed

Table 5. Taxpayers' perceived differences between Sales Tax and VAT.

S/No.	Responses	No.	%
1	VAT is chargeable on goods bought while sales tax is chargeable on goods sold	774	68
2	VAT is charged on many goods while sales tax is charged on certain fair luxurious goods	135	12
3	VAT can easily be offset while sales tax is not off Settable	9	8
4	VAT is on consumption and utility while sales tax is on transfer of goods/services	63	6
5	It is easier to collect VAT on imported goods than sales Tax	36	3
6	VAT is levied on all restricted companies such as hotels	27	2
7	VAT allows tax refund while sales tax does allow tax Refund	18	1
Total		1143	100

Source: Authors (2013).

to have seen a copy of VAT Decree also claim to have read and understood it. Only 3% of these professional men could talk about the content of the VAT Decree. To determine how much of the VAT law was known by taxpayers, we decided to ask some specific questions. Only few respondents (Professional men 3%; business 4% and laymen 2%) could somehow describe who VATable person is. None of the respondents in any of the three groups could identify the exact number of categories of V Arable goods and services, which are 11 and 24 respectively. However, they were able to identify some of the VATable goods such as electronics, cigarettes, wine, manufactured and assembled goods, raw materials for industries, spare parts, Supermarket goods, motor vehicles, heavy equipment and tractors, including materials and office machines etc. Some of the commonly VATable services identified by respondents including banking services and hotel services. We observed that most taxpayers did not know that commercial vehicle spare parts are VAT exempt.

Some respondents (professional men 34%, businessmen 27% and laymen 30%) are aware that some goods and services are VAT exempt. All the goods mentioned as VAT exempt by taxpayers are actually so, except that some of the services which the taxpayers considered as VAT exempt are not really so. For instance the taxpayers considered water and electricity supply, banking services and legal services as VAT exempt. This is not correct particularly banking service. It is only the services rendered by the Community Banks, People's Bank and mortgage institutions that are VAT exempt but not commercial banking services. There were some services mentioned by the respondents like barbing and housewife services, which are not included in the list of VAT exempt services. The fact that these services were not included in the list of VAT exempt services shows the exhaustiveness of the list.

Further enquiry showed that only 34% of the professional men, 24% of the businessmen and 28% of the laymen knew the application VAT rate (5%). We further explored the understanding of the taxpayers, on other VAT related concepts such as input tax, output tax, tax credit, tax refund and who is a registered person and his responsibilities. We observed that most of the taxpayers were not familiar with these concepts. They could readily identify the responsibilities of a registered person. Few of the respondents (professional men 27%, businessmen, 22% and laymen 21%) were aware of some of the VAT related offences and their penalties. Some of the commonly mentioned VAT offences are furnishing of false documents and claims, evasion, failure to issue tax invoice, failure to register and obstructing VAT inspectors from carrying out their duties.

8. Tax Payer's Assessment of Impacts of VAT

About 28% of the professional men, 39% of the businessmen and 43% of laymen knew that they purchased VATable goods or subscribed to VATable services. Others were not sure. Beside 4% of the businessmen, other respondents were not in the habit of keeping records of VAT they paid and hence it was not easy for them to determine the proportion of VAT in their total tax payment in a year.

The respondents were asked to consider the adequacy of flat VAT rate of 5%, the equity in VAT distribution, as well as impacts of VAT on individuals, business organizations and Nigerian economy. Not many of them could speak confidently on the adequacy or otherwise of the current rate of 5%. For those who considered it as inadequate (professional men 19%, businessmen 46% and laymen 5%), they argued that the rate was too high and that it failed to differentiate between classes and income groups. They suggested that VAT rate should vary from the income group and that the range of VAT exempt goods and services should be expended. We also observed that many of the taxpayers could not rightly identify the correct distribution formula for VAT proceeds (See **Table 1**). It was difficult for the respondents to comment on the adequacy of the distribution formula. However, respondents could identify some impacts of VAT since its inception. The taxpayers could agree as to the gains of VAT to individuals and business organizations except the nation as a whole. The only indirect gain of VAT to individuals, which they identified, is the possibility of discouraging the consumption of harmful goods. But this point is arguable of course. The business organizations seem to make no gain or loss, as they could offset whatever they pay as input VAT against output VAT. But the nation seems to be gaining from VAT in terms of the increase in revenue. This view is evidenced by the revenue received by the Federal Government since inception of VAT as indicated in **Table 2**.

Some of the negative consequences of VAT on individuals, business organizations, and Nigerian economy as considered by the respondents are summarized below. To the individuals, VAT helps to reduce their disposable income and consequently reducing their volume of consumption of goods and services. Some of the negative consequences of VAT to the business organizations as recognized by the respondents are as follows:

- 1) The increase in the cost of doing business in Nigeria (*i.e.* increase in cost of production or sales);
- 2) Reduction in volume of sales;
- 3) Burden of rendering VAT returns: increase in record keeping activities and their associated costs;
- 4) Reduction in net operating income; and
- 5) Incidence of multiple taxation.

It was claimed that VAT had increased the general cost of living in Nigeria.

Finally, we examined what problems the respondents considered to be confronting the operation of the VAT system in Nigeria. Some of the problems of VAT system in Nigeria as outlined by the respondents are detailed below:

a) Human Problems

Some of the human problems bedeviling the VAT system in Nigeria include the following:

- 1) Failure of the VATable persons to register for VAT;
- 2) Dishonesty on the part of the registered person either by delaying remittance or failing to remit VAT proceeds collected; and
- 3) Possible diversions of VAT proceeds and inability to give proper account of what VAT proceeds have been used for.

b) Technical Problems

Some of the technical problems raised by the taxpayers include evidence of poor VAT collection, lack of enforcement and follow-up system by the administrators.

c) Logistic Problems

The respondents agreed that the failure of the Government and its relevant tax authority to adequately publicize VAT Decree are responsible for its poor understanding by the taxpayers.

The respondents however identified the roles they expect individuals, Non-Governmental Organizations (NGOs), tax authority and government to play in solving the problems. Some of these roles are considered below. Individual taxpayers are expected to increase their knowledge on tax education, imbibe the culture of tax records keeping, and learn to comply with VAT Decree etc. The NGOs could join governments in serious enlightenment campaigns on tax law and tax matters. They could help to ensure strict compliance with VAT Decree in their transactions; register and keep adequate necessary VAT records, and ensure prompt remittance of VAT proceeds. The Governments could help in ameliorating VAT association problems by doing the following things:

- 1) Employ competent and adequate staff to man the VAT section;
- 2) Educate the public on tax law and tax matters;
- 3) Provide attractive tax relief to individual taxpayer;
- 4) Be more dutiful and aggressive in tax collective and administration;
- 5) Enforce strict compliance with VAT legislation amongst the VAT registered persons;
- 6) Enforce prompt remittance of VAT proceeds by VAT registered persons;
- 7) Set up VAT monitoring team who will be going out on a regular basis to carry out on-the-field-assessment of compliance with the law.

The governments are also expected to embark on

public tax education in general and VAT enlightenment campaigns in particular. The Governments should ensure that however VAT proceeds, what collected from the VATable persons should be judiciously utilized so that the public commitment and loyalty to tax payment could be enhanced.

The observance of constitutional duties of tax compliance by citizens is predicated to the extent of their awareness and understating of tax laws. From our study, we observed as follows:

1) That the majority of Nigerian taxable persons is quite aware of the operations and knew that VAT law exists but many have never seen a copy nor talk, read and understand it. This is perhaps responsible for the difficulty of understanding the technical concepts contained in VAT law;

2) There is no remarkable difference in the knowledge of VAT law by the businessmen and professional men from those of laymen. We could conclude that the present form of general education does not guarantee tax education. Most of the professional men in this study could not demonstrate better understanding of the VAT law than Businessmen and laymen;

3) That poor understanding of various tax laws by taxpayers could be responsible for the high magnitude of their non-compliance.

Various suggestions were made on how to improve the level of awareness and general understanding of the taxpayers on any new tax law. The roles of the individuals, business organizations, NGO's and Government in improving the general tax education amongst the citizens in Nigeria were considered.

In conclusion, we believe, it follows that inclusion of tax education into our national education curricular, particularly from the secondary school level to the higher institutions of learning, will help greatly to improve the citizens' general understanding of various tax laws and matters. The legal drafting of the tax laws should be made less technical, having in mind the level of understanding of the taxpayers. Attempts should be made to popularize tax laws as soon as they come out and from time to time, efforts should be made to make copies of various tax laws readily available to members of the public. The need to promote the habit of keeping tax records by various taxpayers, including the individual, cannot be overemphasized. Currently, individual taxpayers do not keep their tax records and hence might not even know what proportion of their total tax is made up of VAT. Tax education could inculcate this habit of taxpayers, as it would increase the magnitude of voluntary tax compliance, decrease the incident of various tax offences inadvertently committed by individual taxpayers, and consequently enhance the revenue generation capability of taxation.

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Changes in Multinational Industrial Enterprises through the Adoption of Innovation: Case of E-Business in Brazilian and Foreign Capital Companies

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ABSTRACT

The objective of this study was to understand the changes that took place in large multinational industries acting in the physical world that, by adopting e-business, started acting in the virtual world, as well as the needs that led to this adoption. Method: multi-case study with two companies, a national industry (“A”) and a subsidiary of a developed country (“B”) in Brazil. Results: In terms of motivation, both companies mentioned an increase in revenue, but “B” highlighted its alignment with global strategy, focused on innovation and e-business, as a “showcase” of the company’s innovative side. Logistical transformations: “A” hired a logistics operator; “B” developed internally adapted logistics, taking advantage of knowledge from its headquarters.

Keywords: E-Business Adoption; Multinational Industries; Innovation; Logistics; Organizational Structure

1. Introduction

Most large industries established in Brazil have their roots in the “physical world” and did not have activities in the “virtual world” at the time when the Internet came to be. However, with the advent of the Internet as a business tool, many companies began to understand that this tool could be a way to further their business, leading companies to adapt their operations to the virtual world and expand their commercial frontiers.

Turban *et al.* (2006) [1] define “e-business” as activities that use the Internet to facilitate the trade (purchase and/or sale) of goods, the provision of services to the consumer, collaboration with commercial partners and the performance of transactions within an organization.

One of the great innovations brought about by the Internet was disintermediation. Large industries historically did not directly connect to their end clients and therefore required that middle-men could now make such a connection. Mehta & Shah (2011) [2] identify several reasons to incorporate e-business as a new distribution channel for companies, with particular emphasis on the potential for geographic expansion and greater exposure in current markets.

E-business has been growing in recent years. Data from the Brazilian Institute of Public Opinion and Statistics (Instituto Brasileiro de Opinião Pública e Estatística)—IBOPE (2012) [3] show that the number of Brazilians that access the Internet has reached 79.9 million in the fourth quarter of 2011, an increase of 8% relative to the same period in 2010. The website *e-commerce.org* (2011) [4] states that, in Brazil, online sales clearly tend to increase and that since 2008, the billing of e-business has grown 30% yearly and is expected to maintain this rate over the next three years. The website *Internet World Statistics* (2011) [5] reports that Brazil currently has 76 million Internet users, a number that has grown 900% since 2000.

Tigre & Dederick (2003) [6] state that e-business has become an instrument that is increasingly used by traditional organizations as a means to complement their business. Of the various types of transactions that occur in e-business, perhaps one of the most well-known is *business-to-consumer* (B2C), *i.e.*, business between companies and end consumers, a practice also known as electronic commerce or *e-commerce* for short.

By adopting e-business or, more specifically, e-com-

merce, industries establish an innovation process regarding the implementation of new ideas in a given context and assume collective interactions (Sternberg; Pretz; Kaufman, 2003) [7]. Porter (2001) [8] states that the issue is not whether companies should use the Internet to do business but rather how best to use it if the company is to remain competitive. Regarding achieving this aim, the key challenge is the possession or implementation of an organizational structure capable of handling this demand.

Many companies in the real world are trying to change their structures to support a virtual business model, as stated by Kalakota & Robinson (2004) [9]. Although there has been considerable study on the subject of retail companies operating in the electronic world, little has been written about industries using B2C as a means to directly contact their end clients. This new operation impacts various segments of the company. Once disintermediation takes place, tasks that were previously delegated to an intermediary, such as delivering products to the end consumer, must now be addressed by the Industry itself, which did not have to do this before adopting e-business. When implementing B2C models, industries also need to adapt with respect to merchandise volume, because traditionally, industries sell to distributors and wholesalers, who tend to require large production volumes. However, the logistics of an e-business model generally involves small volumes; this transition is a very complex operation for industries that did not previously operate in the virtual world.

In this context, the goal of this study was to understand the changes caused by the adoption of e-business or, more specifically, e-commerce (a B2C relationship), in large multinational industries that acted in the physical world and started acting in the virtual world, as well as the needs that led to this adoption. Of the changes that were investigated, the focus was first on those taking place in the organizational structure of the companies under study, given the relevant role of a company's organization in taking advantage of the opportunities of e-business. Secondly, attention was also given to the transformations that took place in these companies' logistics because, although the adoption of e-business is associated with significant advances in commercial transactions, according to Barlow *et al.* (2004) [10], the same does not happen with logistic flow, subjecting B2C consumers to new logistic bottlenecks in addition to those that existed in the normal distribution process. To Fuchs & Fleury (2003) [11], fractionating delivery to the B2C client is recognized as one of the greatest challenges to companies, due to both the geographic comprehensiveness and the obligation to deliver the product directly to the consumers' house.

This study had the following goals:

- Identify the needs that led organizations to adopt e-business;
- Verify the main changes that took place in the logistic processes and the organizational structures of the industries under study due to the adoption of e-business, specifically B2C;
- Identify the benefits and difficulties stemming from the adoption of e-business.

To achieve these goals, two multinational industrial enterprises were studied; one with roots in a developed foreign country that was active in Brazil as subsidiary and another of national origin that was founded in Brazil. The companies chosen, aside from being high-profile multinationals, have one particularly relevant difference. The national company is a headquarters, while the foreign multinational is a subsidiary. These companies were chosen to determine the differences in the adoption of innovation due to either a headquarters or a subsidiary. For the headquarters, e-business is something completely new, while for the subsidiary, e-business is a *roll out* because its headquarters has already implemented this process in other countries and therefore has knowledge and experience obtained outside of Brazil.

According to Stal & Campanario (2011) [12], the academic interest of national capital in Brazilian multinational companies is relatively new, not older than two decades. There are dozens of studies focused on companies of Southeastern Asia but very few about Latin American companies, further justifying the study of adopting such a Brazilian multinational innovation.

The following section is a review of the literature used to elaborate the questionnaire and analyze the results obtained. Next, the investigation methods applied in the study are presented, followed by the results and analysis and closing remarks.

2. Literature Review

The theoretical foundation for the present study is presented here. First, we describe the concept of e-business, understood as an innovation, and how this innovation is related to the concepts of organizational structure and logistics, followed by the concepts of Brazilian and foreign multinationals.

Turban *et al.* (2006) [1] observe that the origin of e-business dates back to the 1970s, starting with data transfer, more commonly known as *electronic data interchange* (EDI). These authors claim that new applications followed the initial ones, from stock negotiation to the purchase of flight tickets. Mishra (2010) [13], states that e-business is becoming one of the best ways to do business. However, companies in emerging countries still struggle to develop e-business in a sustainable way and

often need to modify their internal structures to promote this innovation. E-business is a fusion of commercial processes, enterprise applications and organizational structure required to create or enhance the traditional model of the company (Kalakota; Robinson, 2004 [9]). In Brazil, e-business initially spread through financial transactions and inside company networks that supported this functionality (Tigre; Dedrick, 2003 [6]). With the widespread use of the Internet, e-business extended its reach to end users, raising companies' revenues along with the number of consumers using this channel to acquire products and services.

Because the adoption of e-business is understood as an innovation for the adopting industry in the present study, it behooves us to define what is meant by innovation and its adoption. Rogers (1995) [14] defines innovation as an idea or object that is identified by the individual as something new. The development process of innovation consists of all decisions and activities, as well as their respective impact in the event of a necessity or problem, during their search, development and commercialization of an innovation. In the Oslo Manual (OCDE, 2005) [15], innovation is a vision based on knowledge and focused on interactive processes through which knowledge is created and exchanged within and between companies. Tidd, Bessant & Pavitt (2008) [16] define innovation as a change process driven by the ability to establish relationships, detect opportunities and take advantage of them. These authors divide it into four distinct categories: product, process, position and paradigm innovation. For the present study, one may consider the adoption of e-business as a process innovation.

For large industries that operated only in the real world, adopting e-business is an innovation. However, there are obstacles, as noted by Johnson (2010) [17], including risk perception, lack of knowledge, trust and organizational availability.

In multinational companies, innovations can be transferred between subsidiary companies, from the headquarters to subsidiaries and vice-versa. Thus, multinationals develop three types of organizational competence capable of contributing to the diffusion of innovation, according to Dunning (1993) [18], as follows: local competences, non-local competences and specific competences. Competences are important for the diffusion of innovation among subsidiaries because they enable companies to create or adapt innovation to their local environment. Subsidiaries that adapt innovations transferred from their head quarters are creating local innovation; those that develop innovation but have difficulty transferring it back to the headquarters, or vice-versa, create specific innovations; and finally, subsidiaries that adapt or develop innovations that are later adopted by others

are creating non-local innovations. According to Oliveira Jr., Boehe & Borini (2009) [19], the greater the autonomy of a subsidiary, the greater its decision power and the capacity to develop innovation initiatives are. However, excessive autonomy may hinder the exploitation of internal initiatives by the multinational corporation and may lead to innovation decisions that target diverging objectives, causing a rupture in corporate strategy.

Foreign multinationals have well-known brands, innovation processes tested in other countries, sophisticated technologies, efficient management systems, financial resources that do not always have their origin in the host country because they seek lower interest rates and efficient networks of suppliers, distributors and logistics (Khanna; Palepu, 2006 [20]). According to Khanna & Palepu (2006) [20], multinational companies that are developed in emerging nations have institutional deficiencies consisting of the lack of efficient innovation systems and regulation, as well as volatile political and economic environments and consumers who, although demanding, are sensitive to prices; an efficient innovation management might mitigate such difficulties. In the case of a subsidiary acting in an emerging nation, knowledge may be transferred from the headquarters in a developed country; knowledge is of particularly high value, considering that foreign markets grant access to new ideas and stimuli that can be applied in emerging nations where the multinational operates (Oliveira Jr., 2007 [21]). The comparison between national and foreign multinational companies in the domestic markets of emerging nations shows that the former develop competence, skills and trust that allow it to compete with foreign companies (Stal; Campanario, 2011 [12]), and, as a consequence, it becomes more competitive in the market in which it operates. Therefore, the study of these multinationals and their innovations, which can lead to competitive advantages, is an important part of the study presented in this article.

Regarding the transformations that may occur in the organizational structure of companies that adopt innovation, in this case, e-business, Vasconcellos & Hemsley (2003) [22] claim that the speed of change and the increase in the complexity of the environment in the last few decades made it necessary to develop structures to effectively respond to these changes. For a long time, a certain set of structural patterns were employed by many kinds of organizations. These structures are defined as the result of a process in which authority is distributed to activities in all levels, from the lowest to the highest. Responsibilities are specified, and a communication system is designed to allow people inserted in this structure to perform tasks and exert the authority they have to achieve the company's objectives (Vasconcellos; Hem-

sley, 2003 [22]). In terms of organizational structure, Costa *et al.* (2010) [23] state that structures without many hierarchical levels that are oriented towards multi-functional teams are better able to adapt to mutating environments that seek innovation.

Regarding the impact of the adoption of e-business on the logistics of the adopting companies, Bornia *et al.* (2006) [24] state that, as a result of this new age of economics where each Internet access may result in a new purchase, logistics serve e-business as a value-aggregating activity, and companies exploiting this strategy may obtain competitive edges that will allow their survival and grant financial return. Following Coelho & Cristo (2007) [25], B2C e-business requires differentiated logistics with particular characteristics that are not traditionally available, such as the integration between information on the availability of a given product on the site (front end) and the actual availability of the said product in stock (back office). In traditional logistics, a material good is thought of as a well-established physical position; in virtual logistics, however, what matters is that the product be available when necessary. According to Alves *et al.* (2005) [26], while traditional logistic systems are developed to serve commerce between companies with orders of large volume, in which most deliveries are made to distribution centers or stores, the logistics of virtual commerce are characterized by a large number of small orders that are geographically spread out and fragmentally delivered, resulting in low demographic density and high delivery cost (ALVES *et al.*, 2005 [26]). B2C e-business requires differentiated logistics with particular characteristics that are not provided by traditional logistics. True, its logistics do present, in a sense, the same concepts as the traditional ones, but they are adjusted to the specific characteristics of an e-business environment (BORNIA *et al.*, 2006 [24]). Tools that are very similar to those used in traditional logistics are employed here; however, they must be adapted according to the particular traits of the process. The adaptation can be considered an innovation for companies that were not founded in a virtual environment but wish to enter this model to service previously unreachable clients.

3. Investigation Method

This study was undertaken with an exploratory aim, is of a qualitative nature, and employed a multiple case study method in which the companies were studied by means of interviews using semi-structured questionnaires, documents made available by the companies and analysis of their websites, thus allowing data triangulation. Vieira (2004) [27] states that qualitative study has been used in some specific fields of study in applied social sciences, and it can be defined as having its main foundation in the

analysis of qualitative data, *i.e.*, it is characterized by not making use of statistical instruments of data analysis. According to Yin (2003) [28], qualitative methods allow the researcher to gain an overview of events within the context of real life, and their use is appropriate in studies that aim to understand complex social phenomena. Given that this study tries to understand, first, the transformations caused by the adoption of e-business, and more specifically, e-commerce (B2C relationship), by large multinational industries that were originally active in the physical world and then started acting in the virtual world, and secondly, the motivations for this adoption, exploratory research of a qualitative nature seemed appropriate. The method chosen for this exploratory investigation was the multiple case study, which allowed for a comparison between the companies participating in the study in terms of how they innovated, their different adaptation processes and the difficulties encountered while adopting innovation.

The companies chosen for the study were selected because they are multinational, one from an emerging nation (Brazil) and one from a developed country, and also because are both large businesses that sell directly to the consumer through e-business (B2C). These criteria greatly constrained the scope of this study because there are few industries in Brazil that sell directly to the end client through the Internet. The comparison between companies of different origins is pertinent because the aim is to investigate whether the branch office acting in Brazil can benefit from the knowledge obtained from the experiences of the headquarters. The companies that were interviewed do not belong to the same segment; however, both are characterized by the production of consumer goods and by having their own websites where they sell directly to the end consumer. This choice was made because two multinationals in the same field but of different capital, *i.e.*, one national and one foreign, both selling their product directly through the Internet, could not be found. Data were gathered through semi-structured interviews and via examination of documents provided by the company, newspaper and magazine articles, the companies' websites and academic articles about the companies. Regarding the semi-structured interviews, nine employees of company "A" and eight of company "B" were interviewed; these employees held positions such as Wholesale Director, Marketing Manager, E-business Manager, New Media Communications Manager, Distribution Manager, Transport Manager, Distribution Center Operator, Supply Chain Manager and New Business Manager, among others. Each interview took approximately one hour, and the subjects were persons designated by the companies themselves as those best qualified to help reach the objectives of the present study.

Complementary data were obtained later through telephone communication and also by e-mail exchange to clarify some details. The analysis of the data consisted of examining, categorizing, and classifying or, alternatively, recombining the qualitative evidence to meet the end goal of the study. No statistical procedures were used to analyze the data because the whole study was grounded on a qualitative approach (Godoy, 2006) [29]. Because this study's investigation is of exploratory character, there was no intention to establish variable correlation.

4. Results and Analyses

The obtained results are presented in this section; both companies under study are introduced, and the evidence that was analyzed to reach the proposed objectives is described.

4.1. Implementation of E-Business in Company "A"

The national capital company, referred to in this study as company "A", is the largest shoe company in Latin America in terms of units produced, with R\$ 3 billion in revenue in 2011, of which R\$ 2.5 billion was from the domestic market. It holds 16% of the national shoe market and 55% of the rubber sandal market. It has 12,000 employees in Brazil and approximately 5000 abroad. Because the company was structured to sell large volumes to wholesalers, department stores or retail outlets, it did not have the knowledge of how to sell directly to the end consumer through e-business. "[...] The company had never before sold directly to the end consumer, and that was a change in our processes [...]", stated the marketing manager. Technical areas, such as Information Technology, had to hire consultants to develop the website, and at a later stage, specialized personnel were hired to manage the e-business component. The idea of adopting the e-business system sprung from the company itself and was fully developed in Brazil. The development of the Brazilian website served as a reference for the development of the online store for the US, Europe and some e-business initiatives in Southern Asia. The company has branches outside of Brazil; however, there was no knowledge transfer from these other units to Brazil. Instead, the Brazilian unit was the head quarters for the institutional development of e-business in its subsidiaries. In the interview, this fact is made evident by the e-business manager: "[...] we worked together with other companies because e-business is a completely new business that normally nobody in an industry fully masters and often, also, in physical retail, it is business-specific".

The project to develop e-business in company "A"

started in a planned manner in 2007 and was consolidated in 2009, when the company put two brands of its portfolio at the end consumer's disposal. The development of e-business as a new channel for the consumer was not a simple task because of the size of the company, which had a large number of departments and personnel involved, in addition to the lack of specific training in the company to adopt this innovation at the time. Additionally, the development of e-business studied here was its second experience in selling products directly to the consumer. The first one occurred in 2005, was not successful and was abandoned in 2006. The adoption of e-business was attempted again in 2007. The interviews and accounts obtained in the present work refer to the second attempt by company "A" to adopt this type of business in 2007. The development took place in Brazil, but the internal knowledge necessary to promote the development of e-business was not available because this was a new activity for the company; therefore, technical training was sought by hiring specialized companies. Technical areas such as Information Technology hired consultants to develop the website, and at a later stage, specialized personnel were hired to manage the e-business.

The Brazilian headquarters did not interfere in the operational structure (warehousing and distribution) of the e-business in other countries. Therefore, subsidiaries had autonomy to hire locals for these services. The guidelines from the head quarters were focused on visual alignment, product organization and brand appeal (pictures of new products, colors and the company logo), in conformity with the Brazilian website, to guarantee brand preservation.

In company "A", the departments involved in this adoption understood that the objectives of this company behave differently, and further, there was no alignment between the objective of adopting e-business and the company's strategic objectives. However, during the interview process, it was concluded that the true motivation had been to increase sales. The process to develop e-business involved, initially, sales and marketing executives and, later, information technology executives. The involvement of logistics in the project's conception and implementation phase was not so markedly present as that of IT, as revealed by the following statements from the transport and distribution managers: "[...] a superficial involvement of logistics"; "[...] we know of the importance, but there was no greater involvement of logistics due to lack of appropriate knowledge and acknowledgement of the project's importance".

In the organizational structure, the e-business area was allocated to the Retail Board, which is responsible for the management of franchises and company stores. This

board made their brands available for consumers to purchase through the Internet because this was a new area, and the company itself was not certain which board would be responsible for the management of e-business. One interviewee from retail said that a more appropriate place for e-business within the company was missing, *i.e.*, company “A” did not have a specifically prepared area for this type of business and thus made use of the existing structures. There was no consensus regarding the necessity of conceiving an e-business project. Interviewees from sales and marketing admitted that the development had its origins in their areas: “[...] everything started in sales and marketing [...]” or “[...] they [sales and marketing] had the idea of organizing the products and making them available through the Internet [...]”. Thus, it is apparent that the true motivations underlying adopting innovation were confounded, and there is no certainty as to what motivated this adoption.

The information gathered from interviewees from company “A” diverges on the necessity of adopting e-business. Data obtained in this study show that the company acted “in an amateur fashion and without a clear objective” that would justify the development and implementation of e-business, as reported by some e-business, company stores and sales managers. Some of the e-business objectives, as stated in these interviews, are as follows:

[...] “a differentiated status for the product, with a sophisticated flair”.

[...] “the opportunity for brands in a field that grows, say, around two digits every year”.

[...] “the goal is to make a mix of products available to the consumer that is hard to find in the common store”.

[...] “to make it easier to purchase, and provide a place where people can research information about the products”.

In its second attempt to implement e-business in 2007, the organizational structure of the logistics of company “A” was called “Distribution” and was placed under the Supply Chain Board. Along with Logistics, the field of Planning was subordinate to this Board. The company justified placing logistics (*i.e.*, distribution) under the same management because both pertain to the same chain of operations. In 2009, the cost to process orders from e-business was lower than that of traditional orders, even though the shipping cost was higher. The logistic flow to process an order proved to be advantageous when compared to the costs of maintaining a physical store, which has additional costs, such as employees, rent, taxes, water, electric power and building maintenance, etc.

Although they do not have physical contact with the product, consumers utilizing the e-business model have greater variety at their disposal, and in general, products

cost less. Logistics, despite their importance and role as a strategic area for the success of activities related to this channel, had only superficial involvement in the process because the company opted to subcontract the logistic activities relevant to e-business, hiring a logistics operator to perform the warehousing, distribution and shipment of orders. The reason given for this subcontracting acknowledged that logistic operations for e-business are completely different from what the company already had in terms of shipment size. This was confirmed by means of an interview fragment stating “[...] the logistic process is completely different from that of a normal store or of a company’s shipment’s and the operator we hired had the required knowledge”. The interviewees in the fields of Marketing and Logistics stated that clients started receiving their orders faster, and in addition, they emphasized that the service provided by the subcontracted operator is one of the best in the country in terms both of punctuality and product quality, *i.e.*, the condition of the merchandise at the moment of delivery.

4.2. Adoption of E-Business in Company “B”

Foreign capital company “B”, founded in 1919 in Sweden, is a current global leader in electrical household appliances, selling over 55 million units per year in over 150 countries. The company focuses on product innovation based on extensive opinion polling to determine the real needs of consumers.

Oriented towards product and process innovation, it adopted B2C in 2004 without the intent to significantly increase revenue; instead, the company aimed to implement an innovation in Brazil that was already common practice in other countries, such as Italy. Thus, the main objective of adopting e-business was the alignment of the branch office’s objectives with the company’s global strategy, so that all countries shared the same processes and procedures, giving the headquarters greater control over its global operations. However, at the end of the implementation, they also gained commercial insight into e-business, similar to company “A”. In the last three years, the process was considered to be consolidated by company “B” after a period of transformations in IT (Information Technology) and Logistics, areas considered to be essential to and responsible for the high performance demanded by consumers that favor the e-business channel to acquire their products.

Company “B” sees the adoption of innovation as something of extreme importance, reflected in a mark by the distribution center’s operator: “[...] innovation is ‘in the blood’ of the company [...]”. It is part of the company’s mission to provide innovative products beyond consumers’ expectations. However, even if the search for innovation is part of the company’s mission, the Brazil-

ian branch resisted the adoption of e-business (understood as innovation) because, at first, this was not an opportunity to increase sales but rather a model “suggested” by the headquarters to promote a global alignment with the operations in other countries.

Regarding organizational structure, the Brazilian branch of company “B” consists of five boards. Supply Chain and Sales are responsible for Logistics and E-Business. The Projects area, physically located in Curitiba (PR), is subordinate to the Supply Chain Board; this area is responsible for the development of new processes or procedures that originate from the headquarters or are idealized in the subsidiary itself. Company “B” planned to adopt e-business, and the Project Coordination area, responsible for the development and implementation of innovations originating from the headquarters, coordinated the whole process. After implementation, the professionals who were part of this coordination area were no longer part of the e-business staff and returned to the project area to work on development demands. As stated by the projects and new business manager: “[...] the company adopted this condition and invested because there is a culture of structured innovation, and it does not consider chance [...]”.

Interviewees stated that there was no change in the final design for e-business implementation as proposed by the Brazilian branch because the headquarters approved of and trusted the professionals who were responsible for the execution. These professionals consisted of a multidisciplinary team from the project and e-business areas. Company “B” thus implemented this electronic sales channel with a local team without having to hire third parties or consultants but instead involved all areas, such as logistics, finance and information technology, preserving the local traits of the country. Company “B” attributes a good deal of the success in this implementation to the support given by HR to the people who were involved in and affected by the innovation and the use of e-business.

The company’s Logistics achieved national coverage, with a strong concentration in the Southeast. This is to be expected given that the main clients, large retailers, are concentrated in this region. With six companies shipping their products, company “B” acquired relevant experience in delivering large volumes concentrated in a few clients, and until the start of the e-business project, it did not ship directly to the end consumer. The internal operational structure is the same for the logistics of e-business as for the traditional one, *i.e.*, the logistics personnel of company “B” share the management of both channels. This situation is identical to what is found in distribution centers, cargo aggregators and transportation companies, according to accounts of interviewees from the e-com-

merce and logistics areas. The first transformation to take place, as identified by the company, was the delivery of small shipments, which spiked in amount and number of destinations. As a result, the company looked for transportation companies that were more fractional-load oriented (small shipments) and specialized in e-business. Another change perceived by company “B” was that e-business customers are more demanding in regard to delivery punctuality.

Table 1 presents a synthesis of the main results found during the study conducted on companies “A” and “B”, classified according to the analysis categories identified by the content assessment. The table below was obtained from the analysis of the speech of all respondents, identifying in these discourses possible categories (or labels) that best translate into the language of business that has been said by the respondent managers. Therefore, the answers about the process of adoption of e-business by companies can be summarized by the following groups or categories of findings: needs that led to e-business implementation; difficulties in adopting e-business; benefits brought about by the adoption of e-business; transformations in logistics; transformations in organizational structure; process of knowledge transference from the headquarters to its subsidiaries regarding the implementation of e-business; commitment to innovation; and alignment with the strategic objective.

4.3. Analysis of Results

For the analysis of the results, in addition to the primary data obtained, we use a comprehensive literature review to support the findings of this research to compare what was found with what is established in the literature cited, thus, we can ensure that the analysis made is based in a theoretical framework that make our conclusions be more robust.

For Rothwell (1994) [30], Ahmed (1998) [31], Valadares, Serio & Vasconcellos (2012) [32] and Zilber (2009) [33], there must be a strategic objective that “guides” innovation within a company. This objective is not clear for company “A”, and there is also no alignment between strategy and e-business because the executives never give an indication that e-business is supported by a strategy defined by the headquarters. In company “B”, a foreign multinational and subsidiary of its headquarters, the adoption of e-business was done in alignment with the overall strategy; in 2004, this multinational sought to standardize management models across all areas of its subsidiaries, so that they would have identical processes, and therefore, headquarters would have better control of the branches. According to Tidd, Bessant & Pavitt (2008) [16], developing new processes constitutes one of the ways companies innovate. This was observed

Table 1. Synthesis of categories found in the study.

Category of findings	Company "A"	Company "B"
Needs that led to e-business implementation	Increase in revenue.	Alignment with global strategy, focused on innovation.
	Channel seen by the consumer as innovative.	Increase in revenue.
	Attractiveness and ease of purchase.	Focus in innovation; e-business as "showcase" of the company's innovative facet.
	Easy way to obtain information about products.	
	Variety of products gathered in a single place.	
Difficulties in adopting e-business	Lack of knowledge to develop the new sales channel.	Non-commercial project.
	Low technological level.	Resistance from departments involved, e.g., logistics.
	Lack of an innovation culture.	Risk of post-implementation failure.
	Inadequate organizational structure.	
Benefits brought by the adoption of e-business	Reduced cost to process an order.	Refined criteria for hiring third parties to deliver products.
	Removal of intermediaries.	Exposition of products without resorting to a physical structure.
	Greater assortment of products made available to the consumer.	
Changes in logistics		Cargo profile: small shipments.
		Fractioned deliveries.
		Assertive delivery dates.
	Employment of third party to operate logistics.	Same internal team for traditional business and e-business.
		Autonomy to ship orders (e.g.: prioritizing e-business orders).
Changes in organizational structure	Lower logistics cost.	Hiring of transportation companies with differentiated, specialized profile.
	Shared structure for e-business in administrative aspects because the operational structure is dedicated to hiring third-parties.	Dedicated structure for e-business in administrative aspects because the operational structure is shared.
	Structure out of strategic focus.	Structure based in foreign subsidiaries. In Brazil, it is an autonomous structure, but its innovations must be validated by the headquarters.
	Lack of hierarchical importance for e-business because the company allocated it to the retail board without strategic grounds.	Stable structure; the area was not shifted to another board because e-business was given hierarchical importance.
	The headquarters could not help its subsidiaries very much because it lacked knowledge of e-business. At most it provided its opinion on some issues, e.g. layout of products in the website.	The headquarters, by means of Project Coordination, provided the subsidiary with all information necessary to implement e-business based in previous knowledge and experiences.
Process of knowledge transference from the headquarters to its subsidiaries, regarding implementation of e-business	No innovation management.	The company's mission is to innovate.
	It is not part of the company's mission to promote and maintain innovation.	Innovation is present at all levels of the company.
	Little commitment from the board.	There are well-defined processes for managing innovation.
	Disorganized processes.	Dedicated staff area for implementing innovations.
Alignment with strategic objectives	Indeterminate objectives in adopting e-business.	Global alignment with the operations in other countries where the company already operates e-business.
	Low priority for the project.	Met the expectations of clients to be constantly innovating.
	Project initiated in departments and not by a board directive.	Fulfilled the objective of strategic alignment proposed by the headquarters.
	Strategic planning without impact.	
Main results obtained by using e-business	Adaptation of organizational structure.	Standardization of headquarters and subsidiaries.
		Hiring of more efficient service providers.
	Deliveries with better level of service (punctuality and quality of product).	Success in implementing the company's strategies.
		Commercial expansion.

in this study, where both companies developed a change process to take advantage of a perceived business opportunity, in this case, e-business, allowing for increased sales in their markets, independent of the needs that drove them to innovation.

Company “A” did not show a capacity for innovation, as evidenced by the lack of trained professionals that could elaborate and implement a new project outlined by the company as an objective. Ahmed (1998) [31] asserts that, for a company to innovate, the qualifications of its executives are fundamental because they enable the fulfillment of the plans. The hiring of third parties by company “A” (logistics operator) capable of serving the e-business to meet delivery dates and provide warehousing corroborates the findings of Kalakota & Robinson (2004) [9], who emphasize the need to hire third parties to plan and execute projects when a company cannot do everything perfectly and/or there is a lack of technical preparation by the executives, with the intention of increasing efficiency and reducing costs.

In company “B”, the culture of innovation is evident because it has an organizational structure oriented toward innovation that encourage similar actions with other areas, which contributed to the success of the project. The Brazilian subsidiary received knowledge transferred from the headquarters, which had already implemented the same e-business project in other countries; therefore, the adoption of e-business occurred in a planned and organized fashion, involving a department called Project Coordination, which received and processed all information and brought the right people into the project. The whole innovation process of company “B” was guided by the knowledge and experience of the headquarters and was transferred to the Brazilian subsidiary, in accordance with what Oliveira Júnior (2007) [21] states about the importance of knowledge transfer between headquarters and subsidiaries. Regarding the autonomy granted by the headquarters to its subsidiaries for innovation, company “A” did not differ from company “B”, a multinational of foreign capital. This corroborates the findings of Oliveira, Boehe & Borini (2009) [19], who report that there is no difference between the autonomy given by multinational companies of either national or foreign capital and that autonomy is linked to both the time that the subsidiary is in operation and some strategic functions. Regarding the organizational structure of company “B”, transformations took place to better serve e-business because, according to Vasconcellos & Hemsley (2003) [22], the speed and changes in the environment in which companies operate force them to develop adequate structures for this electronic sales channel. Amabile *et al.* (1996) [34] suggest that the organizational structure does not impede management allocation but makes it more difficult to inno-

vate and, later, improve. Because of this, company “A” takes longer to adapt and, in the future, may be hindered in making improvements. The development process of e-business in company “B” was supported from the start by the subsidiary’s board as well as by the headquarters, where the issue was first discussed. Zilber (2009) [33], states that the involvement of high-level administration is fundamental to success, bringing strategic weight to the dedication to the project. However, in company “A”, the origin of e-business was not the board of directors, but the managerial level of the sales and marketing areas, giving the project an image of low priority throughout the company, or what Rothwell (1994) [30], denotes as lack of strategic backing, and demonstrates that company “A” lacked attitudes that assured its commitment to innovation. This is in contrast to company “B”, where a specific department was responsible for the e-business implementation project and managed it from the beginning (Project Coordination). Once the project had been implemented, e-business management was elevated to the managerial level. With regard to autonomy, the headquarters of company “B” gave total freedom to its subsidiary to modify its organizational structure. However, this freedom was limited, and headquarters’ approval was needed. Oliveira, Boehe & Borini (2009) [19], state that the autonomy given to subsidiaries is connected to strategic issues, and therefore, the headquarters of company “B”, despite approving its subsidiary’s whole project, also approved every step of the project because it was an important global strategy for the corporation. Regarding approval from the headquarters, a similar process occurred in company “A” because the headquarters granted its subsidiaries autonomy in operational issues but not in the conception of innovation.

In the present study, logistics was the key point for the success of e-business for both companies. Bornia, Donadel & Lorandi (2006) [24], highlight the importance of logistics as a value-aggregating activity in supporting e-business, allowing a company to survive. Clearly, companies that adopted this sales channel needed to modify their logistics processes to better serve e-business. The logistics of company “B” went through transformations due to the unique characteristics of e-business, starting with the issue of shipments and deliveries that decreased in size, increased in number and were delivered to the houses of end consumers. This transformation was foreseen by Alves *et al.* (2005) [26], Fleury & Monteiro (2004) [35], and Bayles & Bathias (2000) [36], who state that traditional logistics systems are oriented towards large volumes and centralized deliveries. Conversely, company “A” did not adapt, opting to hire a logistics operator that had the necessary skills to coordinate its e-business. Johnson (2010) [17] calls this inability to

adapt the lack of organizational availability, which consists of a learning deficiency and culminates in a barrier to the adoption of innovation.

5. Closing Remarks

Our findings corroborate those of Vernon & Wells (1991) [37], Rothwell (1994) [30], Zilber (2009) [33], Valadares, Serio & Vasconcelos (2012) [32] on the importance of the existence of alignment between the strategy and the objective of adopting an innovation, in this case of e-business. The importance of an organizational structure, that is adequate to implement e-business, is also apparent. Such a structure guarantees a level of authority for making decisions that can meet the intended objectives, as postulated by Vernon & Wells (1991) [37], Venkatraman & Henderson (1998) [38] and Vasconcelos & Hemsley (2003) [22].

The main contribution of this paper is to show which structure and logistics were used for the adoption of e-business by an industry, since most of work on e-business comes to retail sector and not to industries. Regarding the first goal of this study, *i.e.*, the identification of changes in industries in the adoption of e-business with a focus on the organizational and logistics structure, based on all the interviews summarized in the previous session, company “A” opted for the subcontracting of logistics, allocating e-business activities at a hierarchical level of no strategic relevance, while company “B” had a structure dedicated to the administrative aspect of e-business and had a Projects area dedicated to its implementation in Brazil following the headquarters’ directives. Regarding changes in logistics, both companies obtained a freight profile with smaller shipments, fractioned deliveries and accurate delivery dates. Both companies mentioned the increased revenue as a motivation to adopt e-business. Company “A” also identified attractiveness and ease of purchase, ease of obtaining information on products and the variety of products gathered in a single place as motivations for adopting e-business, while company “B” mentioned alignment with the global strategy of innovation, using e-business as “showcase” of the company’s innovative side as great motivators. The main difficulties in the adoption of e-business were mostly due to the lack of training for adopting this innovation (low technological capacity, lack of innovation culture and inadequate organizational structure) for company “A”, while company “B” mentioned the initial resistance of the departments involved (e.g., Logistics).

There were also differences between the two companies regarding the process of adopting e-business. The foreign multinationals benefited from the headquarters’ previous knowledge of adopting this innovation, while the national company had a less direct adoption process,

having first failed to adopt e-business. Different methods of adopting e-business are identified in companies “A” and “B” because the culture of company “B” is focused on innovation—also referred to in its mission—and its consumers expect the company to act innovatively, as reported multiple times in the interviews given by its employees. Thus, the adoption of e-business by company “B” occurred in a more planned and structured way because this company possessed the necessary structure and knowledge to implement a new business model in Brazil (*i.e.*, the use of e-business). Moreover, everyone involved in new projects in company “B” is coached by a permanent staff detailed in the organizational structure (Project Coordination), which after training the areas involved in this innovation, returns to its original position and starts working on the development of a new process with the relevant departments.

The innovation of this paper is to compare an emerging country multinational company (MNC) and a developed country multinational company (MNC) regarding the deployment of e-business, showing how the developed country MNC has advantage over the emerging country MNC in using all his knowledge from his mother, while the emerging country MNC struggles to find the most efficient way to deploy e-business.

One limitation of the present study is the chosen method because the results cannot be generalized to all companies. In future studies, the number of interviewed companies can be increased, and studies of specific industry segments can also be performed.

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Organizational Efficiency in Electric Mexican Enterprise: Luz y Fuerza del Centro (LyFC) as Reason for Extinction

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ABSTRACT

This paper analyzed the internal and external factors that determined the efficiency of LyFC before its extinction, allowing for a comparative assessment of perceptions in which former electrical workers argued the unconstitutionality of this action, and the Federal Government justified under the low efficiency argument that was reflected in the decrease of indicator User Interruption Time (TIU), an indicator in which the Federal Government determines the efficiency of the Agency. The study is correlational, descriptive, transversal and applies a measuring instrument with 93 items to a population of 267. For the analysis of results, we used SPSS and descriptive statistics and inferential. The results allowed us to point out that the budget allocation variables, technology, work organization, material assignment, administrative efficiency, distribution networks, housing growth and external factors mentioned in this research itself directly influenced the efficiency of the Light and Power Center (LyFC) and explanatory variables were terminated. Moreover, the comparison of operating performance and workloads receiving utilities shows that although the Mexican Federal Electricity Commission (CFE) is a very inefficient, labor costs and benefits were higher in LyFC and were certainly a reason, its extinction.

Keywords: Electrical Industry; Efficiency; Utilities; Light and Power of the Center; CFE; Mexico

1. Introduction

Until 2009, Mexico had in electric industry two public companies operating as a monopoly; light and power central region company *Compañía de Luz y Fuerza del Centro* (LyFC) (from now) and the Federal Electricity Commission (CFE from now).

(LyFC), underwent several changes in its structure as a business generator and distributor of electricity, from its creation to its extinction. Among LyFC and CFE, they guaranteed access to electricity to 97% of the Mexican population. Both public companies were decentralized, with legal personality and its own.

The principal problems in LyFC were:

Lack of materials on time was caused by delays in some areas, mainly in the maintenance and construction new power feeders for new services [1].

Human resources management was inefficient. At the time of termination of employment made a loss of 240 billion pesos, only 80 billion corresponded to active em-

ployees and 160 billion to retirees [2].

The investment in training, was not reflected in increased productivity.

The rise of position and employees was unrelated to the employee's performance [3].

There was no proper supervision in materials which ultimately led to the delay of the work to be performed, due to the lack of materials [4].

Similarly, the following arguments were put forward by the Mexican federal government (Calderón president 2006-2012 who in 2009 decided its extinction):

... "That since its inception, the decentralized organization has continued to receive substantial budgetary transfers, which far from decrease have been increased in recent years, suffice it to say that from 2001 to 2008, such transfers increased by more than two hundred percent and that for this year such transfers will be around 41.945 million pesos, to continue the same behavior, it is estimated that total could reach 300 billion pesos during

the present administration;

That costs almost double its sales revenue, from 2003 to 2008 recorded sales revenue of 235.738 million pesos, while its costs were \$433.290 million pesos (including electricity purchased from the Federal Electricity Commission);

1) The percentage of total energy losses of Luz y Fuerza del Centro is excessive and almost three times higher than the person lodging the Federal Electricity Commission.

In June 2009, Luz y Fuerza lost 30.6% of energy, while that Commission lost 10.9%, almost no utility in the world recorded the percentage of losses that presents LyFC.

2) In 2008, Luz y Fuerza lost 32.5% of the energy generated to buy and sell. The estimated value of these total losses amounted to nearly 25 billion pesos, which represents 52% of total sales revenue of the organism, and

3) In the best case, the unit costs of the works executed Luz y Fuerza del Centro is 176% higher than the costs of the Federal Electricity Commission... [5].” The aim of this paper is to analyze the organizational efficiency of LyFC as extinction ratio by benchmarking perception among various employees of the defunct company. It is organized as follows: In brief, it presents the results of international experience in the efficiency of the electricity industry, describes the most outstanding one and briefly mentions the research methodology, and after comparing the operating performance of the company and stating labor versus CFE LyFC, it finally analyzed 8 variables which measure the perception of efficiency. The determinants of efficiency in an electric utility are: allocation of budget, technology, work organization, material assignment, administrative efficiency, distribution networks, housing growth and external factors.

2. The International Context

After a decade of openness to investment in the electricity markets in the world, there is clear evidence of its success or failure [6].

There are successful experiences that have been made to increase efficiency, power quality and productivity at the same time it has managed to attract capital and reduce prices. There are also experiences less fortunate, in that the continuity and quality of supply have degraded, or prices have skyrocketed. In some cases, the State, it was out, had to intervene directly to prevent further damage to the national or local economy [7].

The California crisis that began when the energy market was liberalized at the state level in 1996, meant that in the summer of 2001 that the state suffered blackouts of between 20 and 200 hours. With the policy of 1996, in which energy prices were no longer under

state control, they began to be governed by the laws of supply and demand. The speculation caused prices to soar and they create serious problems for utility companies, which had to pay a lot more for energy generating companies, and could not move the new costs, as the price paid by consumers remained subject to regulation [8].

In Chile the power outages in 2001 strongly bothered business sectors, especially in the trade and the mining industry, for the economic losses caused by the lack of energy. Concern mining sector concerned court implied that each stop producing hundreds of thousands of tons of copper, mostly. Analysts linked the sector indicated, by way of comparison, in the court on July 25 of that year, when the Great Northern was without power for 15 hours, the industry lost about \$7 million, which means more than \$466.000 per hour without producing.

In Brazil, the current situation of the electricity sector is also critical. The reasons date back to the 1980s, when a cross-subsidy system was a strong disincentive to efficiency improvements, and budget problems delayed investments. Despite the introduction of new legislation in 1995 aimed at enabling and attracting private capital and the power sector, new investments in generation and transmission that were expected until today have not materialized in the amounts needed. While private companies control 80% of the country's distribution system, few private investors are willing to take the risk of building new plants, firstly, because of the uncertainty created by the incomplete implementation of the reform and on the other, as a result of the 1999 financial crisis, which has increased the country's currency risk. The situation is far from being resolved, since only a few of the fifty or more power stations gas ignition that the government is promoting the Thermoelectric Priority Program can start operating in mid-2002 [9].

3. State of Art

Efficiency, also known as productivity is generally understood as the relationship between the output obtained by a system of production or services and the resources used to obtain, can also be defined as the relationship between the results and the time used to obtain them: the shorter the time it takes to get the desired result, the more productive the system.

In the area of professional development, efficiency is the economic index that relates production to the resources used for this production, expressed as production/resources [10].

The term global efficiency is a concept that is used to help improve productivity through the study and discussion of the determinants of efficiency and of the elements involved in it [11].

In reviewing the studies on the efficiency in the power

sector were 118 jobs within which are the following: [12] presented an empirical study of the determinants of energy efficiency in the companies during the period 2005-2009, we investigated the relationship between efficiency and productivity change of these companies, the results of the study indicated that low productivity growth is more related to poor performance rather than technological changes.

[13] found that the electrical efficiency and vertical integration in presenting an economic model for the US business.

[14] studied the effect of the quality of performance-based regulation through reward and penalty system design for power distribution companies.

[15] found that the cost Benchmarking depending on the efficiency increases with the use in the regulation of electrical power.

[16] suggests that the efficiency of the electricity distribution companies is evaluated under an efficiency standpoint productive approach. The analysis methodology consists in estimating production costs of border with parametric and nonparametric. Two individual technical efficiency measurements of the activity distribution of these functions are obtained.

The evaluation confirms actions and strategies that result in cost reduction in the distribution companies. An application under the last Chilean regulatory process is illustrated in this paper.

Proposed a new formula to decompose cost efficiency into technical prices and allocative efficiency in an environment characterized by the fact that the input unit prices differ between certain companies. Using a formula to compare returns between Japanese and US electric power companies, and found a significant difference in efficiency based on price. However, insignificant differences were found in the technical and allocative efficiency.

[17] shows in a simple and general, as it is possible to perform mathematical modeling of the behavior of the physical assets of companies engaged in the business of producing electricity. From when companies achieved without some degree of maturity, are able to apply engineering to properly care for their assets, and obtain their best performance in terms of life and improving the rate of return on investment (ROI for its acronym in English). The savings in resources, obtained with the application of these tools allow companies to keep their finances healthy trend, in terms of growth, framed by efficiency.

Additionally Martinez quantified the effects of some of the main factors that have affected the costs of public utilities in Mexico (lost energy, fuel and labor), noted that the impact of rising fuel prices on Total costs of public utilities have been important in recent years. However, it also notes that the cost of energy losses and

the “overhead” work are significant and comparable, overall, the impact of increased fuel prices.

4. Research Method

It is a correlational research that examines the association between efficiency and budget allocation, technology, organization of work, allocation of materials, administrative efficiency, distribution networks, housing growth and external factors.

As a general hypothesis is to study if there is a positive association between:

Budget allocation, technology, work organization, allocation of materials, administrative efficiency, distribution networks, the housing sprawl, external factors were the main variables that determined the Mexican electricity sector efficiency.

Given a confidence level of 90%, with an error level of 10% a chance of success of 50%, as the probability of failure and a population of 35,000 elements, which are LyFC employees. 267 effective surveys were conducted to achieve the purposes set forth in correlational research.

The population used for lifting workers surveys were Western Zone of the sectors that shaped western metropolitan management pertaining to the distribution sub both administrative, technical or operational as: linemen, engineers, clerks, draftsmen, secretaries, reading makers, operators, foremen, etc.

Addition, we studied the calculation of the confidence interval based on the Student t estimating the standard deviation of the data S and calculate the standard error of the mean $= S/(\text{square root of } n)$, then the confidence interval for the mean $x = \text{average} + -t(\alpha/2) \text{ times } (S/(\text{square root of } n))$. Since the difference of the means of samples from two normal distributions are also normally distributed, the distribuciónt can be used to examine whether the difference can be reasonably assumed zero.

For practical purposes the expected value and variance are:

$$E(t(n)) = 0 \text{ and } Var(t(n-1)) = n/(n-2) > 3$$

5. Results

5.1. Comparison Operating Performance and Working CFE and LFC

As a result, we have constructed **Table 1** to compare operating performance between the two power companies that existed until December 2009. L and FC and CFE. Following six variables: global energy loss, nonconformity per 1000, connection time, productivity per worker, penalties for improper collection and PROFECO poor service, sales revenues versus costs 2003-2008.

The productivity per worker in Productivity per worker in France, 4900 MWH, Productivity per worker in Spain,

Table 1. Comparison of operating performance.

Operating performance variable	L y F C	CFE
Global energylosses	29%	10.3%
Complaints per 1000 users	5.08 (2008)	2.01 (2008)
Connection time	6.5 día	1 day
Productivity per worker LFC (Mexico)	751 MWH	Productivity per worker CFE (Mexico) 2494 MWH (1)
Penalty for illegal charges and poor service PROFECO	\$9,000,000 last three years (LFC) was serving 25% of the country's population	\$ 1,247,896
Sales revenue versus costs 2003-2008	It recorded sales revenue of 235,738,000 The costs were \$433.290 million pesos	

Sources: Government IV report Presidency of the Republic, (Rodríguez 2004 Reform, 16/09/04). The Universal, October 19, 2009 citing PROFECO. Retrieved: <http://sdpnoticias.com/sdp/contenido/nacional/2009/10/19/1003/515532>. Extinction Act 2009.

6900 MWH, Productivity per worker in Australia 8950 MWH.

As observed without CFE operating performance is an example of global efficiency in all areas LyFC performance was inferior. One of the basic arguments of the reasons for the extinction of LyFC it is their lack of efficiency and low productivity is checked against the available evidence. Although workers have been identified as deestaloscausantes incompetence is evident that despite enormous influence wing had the Mexican Electricians Union (SME) throughout the management of the company, he was not managing the undertaking, so this lack of competitiveness actually was incubating over the years.

Historical studies that have been done have shown that SME did not direct although the company was responsible for its lack of flexibility and decision-making structure that by making agreements complicated assemblies highly participatory and democratic immense that favored the radicalization and the development of a policy of negotiation based on the premise that no union achievement is reversed. Unlike other parastatals also have strong collective bargaining agreements such as the Telephone Workers Union or PEMEX and SUTERM himself who agreed at the time to give up some gains in the interest of management flexibility. SME in this case did not occur. There was a period during the administration of President Salinas that were made certain concessions in exchange for this leader had national prominence by leading Labour Congress. Its management concluded however, between serious questions of corruption, was finally working base unknown [18].

Although the CFE shines as an example of efficiency in the decree of suppression, far from it, **Figure 1** shows that the largest electric company in France (EDF SA), is two times more productive than the CFE from the point of view of electricity vs. number of workers, the domin-

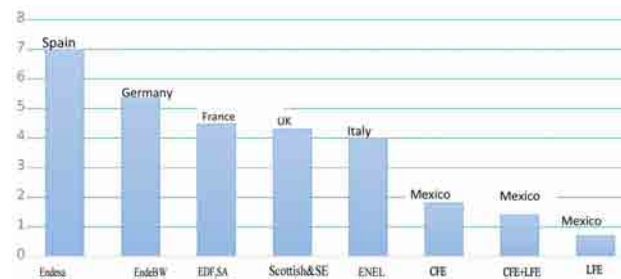


Figure 1. Comparison of labor productivity in electrical companies. Source: F. Hernández, 2006.

ant parastatal France (EDF SA) and said of Italy (ENEL), Germany (EnBW) and the UK (Scottish & SE) are one and half times more productive. The CFE is—by far—the most efficient of the Mexican power parastatal. Once added workers and generating LFC, productivity Mexican parastatal further sinks (one third of the productivity of its French counterpart EDF). The low labor productivity Mexican electricity sector will be further disadvantaged if likened to electricity companies that have ventured into the gas business. For example the German BW more than doubles its labor productivity when adding the energy produced by the gas business with the same workforce (5.58 GWh to 10.15 GWh per worker per worker in 2004).

Drawing on data from other countries, CFE could produce and sell the same electricity at a fraction of workers currently occupied, although there are other factors that make it difficult to compare the productivity of electric companies in several countries (e.g., technologies generation used).

Even if these comparisons are internationally valid is important to note that in the case of LyFC this comparison is somewhat questionable for two respects.

The first is that LyFC installed capacity represented 2.0 percent of the national total, 85.0 percent is CFE and

the remaining 13.0 percent to private licensees. In fact, to get the demand for electricity in the central region, LyFC acquired about 96.5 percent of total supply generated by Power CFE. Actually more than a power generating company LyFC by clear decision that ruled authorities and perhaps for lack of vision of their union, the company was actually a distributor and marketer of energy who sold the CFE.

The second question relates to the labor dimension with which efficiency is calculated, which as stated in the case of CFE can try to compare that dimension with fewer workers as in European countries are three contraction shapes as in the case of Mexico. (Time given, and given work indefinitely).

5.2. Comparison of Benefits and Labor Liabilities and CFE LyFC

One of the biggest surprises of this work is to realize that actually benefits between the two companies do not vary considerably and that the treatment actually given to electrical workers in Mexico is very similar in 11 variables studied were the following: christmas box, energy assistance, savings fund, retirement, monthly support for transportation, rental assistance, help with pantry, overtime, benefits covering transportation, utility and income, labor liabilities increased salaries 2007 and 2000 and a retiree in relation to assets. This comparison is summarized in the following **Table 2**.

The result of the comparative analysis thus proves that even if the privileges enjoyed by workers in the CFE, the

LyFC were superior and undoubtedly contributed to the efficiency medar company which determined its extinction.

6. Result of Research Sovereign Efficacy Perceptions

Below mentioned research questions that guided the research:

PG. What are the internal and external factors that led to the Mexican electricity sector efficiency in its distribution phase Luz y Fuerza del Centro in fighting to improve customer service?

HG budget allocation, technology, organization, allocation of materials, administrative efficiency, distribution networks, housing sprawl & external factors.

Student's t test with all variables.

1.69E-28

Specific Research Questions

Q.1: What influence budget allocation in the Mexican electricity sector productivity in distribution phase Distribution Branch LyFC in extinction?

Q.2: How did technology impact on the Mexican electricity sector productivity in distribution phase Distribution Branch LyFC in extinction.

Q.3: How influenced the organization of work in the Mexican electricity sector productivity in the distribution phase Distribution Branch LyFC in extinction?

Q.4: How influenced the allocation of materials in the Mexican electricity sector productivity in the distribution

Table 2. Performance of workers L y FC y CFE.

PERFORMANCE	LyFC	CFE
Christmas box	54 days of Christmas	54 days of Christmas
Energy assistance	350 kilowatt hours per month free	350 kilowatt hours per month free
Savings fund	11% of his salary, paid by the company	28% onwages and overtime.
Retirement	27 years of service or age 55 with the total performance of an active worker	25 years of service and 55 years old, or 30 years services regardless of age, women 25 years of service regardless of age
Monthly help transportation	14.5% tabulateddailywage	12.5% of their tabulated daily wage
Help for rent	39% of rentalassistance;	37% of yoursalarytabulated
Help for pantry	24.3% of thewages	Retirees 19.3%
Overtime	paid twice and an additional 40% if it is Sunday or holiday days	2% more paid twice and an additional 40% if it is Sunday or holiday days
Benefits covering transport, utility and rent	81.5% of the wages of workers	77.8% of the wages of workers
Increased labor liabilities 2000 and 2007	from 51% to 69%	53% to 62%. (Representing labor liabilities, at the end of December 2007, 62.4% of the total liabilities of the company and 31.6% of total assets).
Salary of a pensioner in relation to assets	26% higher	21% higher

Sources: Mexican Electricians Union, releases various federal agency, Center for Economic Studies of the Private Sector, consultation with various national media. Excerpted from: <http://www.desdelared.com.mx/2009/notas/091012-luz-y-fuerza.html> October 13, 2009 Bank of Mexico 2008, 2008-2010 CST, the Trade Union of Workers Electrical Industry. Excelsior March 7, 2008.

phase Branch LyFC in extinction?

Q.5: How influenced Response administrative efficiency research questions?

Q.6: De qué manera contribuyeron las redes de distribución en la productividad del sector eléctrico Mexicano en su fase de distribución de la Subdirección de Distribución de Luz y Fuerza del Centro en extinción?

Q.7: Qué incidencia tuvo el crecimiento de la vivienda en la productividad del sector eléctrico mexicano en su fase de distribución de la Subdirección de Distribución de Luz y Fuerza del Centro en extinción?

7. Correlation Tests

Q.1: VS Budget Allocation Technology -0.056831

The correlation coefficient r product moment equals -0.056831 , therefore there is not a strong correlation or linear dependence between the increase in the budget allocation VS Technology, this indicates that the use of technology does not depend on budget but on other factors.

Q.2: VS Technology Organization at work -0.028622

The correlation coefficient r product moment is equal to -0.028622 , therefore not a strong correlation and linear dependence between the increase in VS Technology Organization at work. This indicates that the organization of work depends on the technology to be had according to their planned objectives.

Q.3: VS material allocation Administrative Efficiency 0.1675746

The correlation coefficient r product moment is equal to 0.1675746 , therefore there is a strong correlation or linear dependence between the increase in the allocation of administrative efficiency VS materials. This represents a greater allocation of materials attached to quality standards and will increase administrative efficiency.

Q.4: Increased capacity distribution housing VS -0.090811

The correlation coefficient r product moment equals -0.090811 , therefore there is not a strong correlation or linear dependence between VS Capacity Increase housing distribution. This indicates that the increase was not considered housing according to the distribution capacity of the entity.

Q.5: Knowledge externalities 0.116399 VS Technology

The correlation coefficient r product moment is equal to 0.116399 , therefore there is a strong correlation or linear dependence between the increase in the development of Knowledge Technology VS External Factors. Knowledge of the external factors permit an increase in the use of technology commensurate with the growth of user needs.

Q.6: Increase Administrative Efficiency housing VS

0.0883898

The correlation coefficient r product moment is equal to 0.0883898 , therefore there is a strong correlation or linear dependence between the increase in development in administrative efficiency Increase housing VS. This indicates that greater administrative efficiency increased in a disorderly house no impact on the administrative processes of the organization.

Q.7: Budget allocation 0.5473626 VS administrative efficiency

The correlation coefficient r product moment is equal to 0.5473626 , therefore there is a strong correlation or linear dependence between the increase in development budget Assigned Administrative Efficiency VS. This indicates that greater budget allocation will increase administrative efficiency as they used new technologies and strategies for increasing the same.

8. Conclusions

International experience is not conclusive about the benefits of privatization action utilities.

The comparison of operating performance and workloads receiving Mexican utilities shows that CFE is very inefficient, and labor charges and benefits were higher in LyFC and were certainly one reason for its extinction.

The findings with the available empirical evidence allow us to point out that the budget allocation variables, technology, work organization, material assignment, administrative efficiency, distribution networks, housing growth and other external factors mentioned directly influence the efficiency of L y F extinct.

On the other hand, the association tests performed show that no budget allocation fueled technological improvement, and the technology is not positively associated with the organization of work; allocation of materials not associated with administrative efficiency; distribution capacity not expanded to the extent that increases housing in the downtown area, and the external factors impact on the improvement of technology. The efficiency did not address the housing growth that was generated and the only positive assessment was budget allocation allowing him to survive on the deficit that was operated by Light and Power of the Center in the last years of his administration. The great social lesson for unions is that at the same time fighting for the benefits and conditions of its members should monitor aspects such as investment and technology, expansion of productive capacity and overall efficiency, as this determines the survival of the company.

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Technical Efficiency in the Container Terminals in Mexico, 1982-2010: Through Data Envelopment Analysis (DEA)

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ABSTRACT

The paper shows an analysis of the global technical efficiency of container terminals of the main ports of Mexico in the period 1982-2010, through Data Envelopment Analysis (DEA). This methodology allows us to measure each decision unit evaluated in relation to other homogeneous units. The aim of the study is to determine the importance of global technical efficiency, pure technical efficiency and scale efficiency in the ports of México. For this purpose, quay length and number of employees are used as input and as output of the number of containers. The results show that the Mexican ports in general have a low technical global efficiency and only the ports showed that technical global efficiency, technical pure efficiency and scale efficiency were Veracruz and Tuxpan in the year 1982, and Manzanillo and Lazaro Cárdenas in the year 2010. For that reason, it requires better operability which means greater mobility of TEUs.

Keywords: Technical Efficiency; Data Envelopment Analysis; Mexico Ports

1. Introduction

The ports are a very important part in the development of a country, allowing a more efficient transport system. The efficient operation of any of the activities taking place within the port is important for products using shipping to reach the end consumer markets at minimum cost and in the shortest time possible.

In the specific case of container terminals, the market for container services of maneuvers comprises different services that are used to move a container between the boat and land transportation. Additionally, shipping companies, as users, demand high productivity services, so that, to the extent that is greater, the time spent on the boat will be lower, as well as the costs for the use of port infrastructure [1].

Developing efficient port operations can significantly improve the export competitiveness of a nation and the availability of imported products.

The aim of this investigation is to determine the importance of global technical efficiency, technical pure efficiency and scale efficiency in the ports of México and we consider the hypothesis that the container terminals in Mexico have a low global technical efficiency because

they have not achieved significant improvements in the scale of production.

2. Literature Review

Efficiency is defined as “the degree of optimization of the results obtained in relation to the resources used” [2]. Another definition that nicely illustrates the efficiency is “the relationship between the goods and services consumed and goods and services produced, or what is the same, for services rendered (outputs) in relation to the resources used for this purpose (inputs)” [3].

Data Envelopment Analysis model (DEA) is a non-parametric technique that facilitates the construction of an envelope surface or efficient frontier from the available data set under study entities known as DMU (Decision Making Unit) [4]. Technical efficiency has its origin in the early years of the decade of the 50's with Koopmans [5] and the first measure of technical efficiency is proposed by Debreu [6] and Shephard [7], although with different orientation (output and input, respectively). Despite the theoretical relevance of these works, in any efficiency quantified, this task is performed by Farrell [8], which is considered the precursor to the extent of techni-

cal efficiency.

The scheme proposed by him, with the following components, technical, allocative and overall efficiency. In this sense, a particular production process is technically efficient when starting from a certain inputs and assuming a fixed production technology, it achieves the highest possible level of output. Allocative efficiency is achieved, on the other hand, when knowing the prices of inputs and assuming that there may be changes in production technology, their combination allows to achieve a given level of output at the lowest cost.

DEA models can be classified according to:

- The type of efficiency measure that provide: radial and non-radial models.
- The orientation of the model: input-oriented, output-oriented or input-output oriented.
- The types of returns to scale production technology characterized understood as the way in which the factors of production can be characterized by the existence of returns to scale: constant or variable to scale.

Farrell study is complemented by the work of Charnes, Cooper and Rhodes [4], which started at constant yield CRS, such that a change in the levels of inputs leads to a proportional change in the output level, which requires many optimizations as decision units (DMU). It has two orientations: input (a comparison between the minimum level of inputs required for a given level of outputs, and actually taken) and output orientation: (A comparison of the maximum attainable output for a given level of inputs, and the actually achieved). The CCR model works with constant returns to scale, which means that the DMU which has the highest ratio of input product (higher slope) establish the efficiency frontier and DMUs would be accepted under this frontier are considered inefficient DMUs. It can be written in general terms in 3 ways: fractional, multiplicative and enveloping.

It shows the linear programming model guidance output:

$$\begin{aligned} \max \sum_{k=1}^s V_k Y_{kp} \quad \text{s.t.} \quad \sum_{j=1}^m U_j X_{jp} &= 1 \\ \sum_{k=1}^s V_k Y_{ki} - \sum_{j=1}^m U_j X_{ji} &\leq 0 \\ \forall i \quad V_k, U_j &\geq 0 \quad \forall k, j \end{aligned} \quad (1)$$

The assumption of CRS is not always appropriate in real life contexts, later, Banker, Charnes and Cooper [9] extended the original model to include variable returns to scale (VRS). They considered various circumstances such as imperfect competition, restrictions on access to funding sources, etc. It can cause the units not operating at optimal scale and modifying the linear program so that they enter a convexity constraint. To differentiate it from the previous model is called variable returns to scale (VRS). Being the output-oriented model as follows:

$$\begin{aligned} \max \theta_k \quad \text{s.t.} \quad \sum_{f=1}^n \lambda_f X_{if} + S^l &= X_{iz}, i=1, \dots, m \\ \theta_k Y_{rz} - \sum_{f=1}^n \lambda_f Y_{rf} + S^o &= 0, r=Z, \dots, S \\ \sum_{f=1}^n \lambda_f &= 1, \\ \theta_k \geq 0; \lambda &\geq 0, f=1, \dots, n \end{aligned} \quad (2)$$

This modification allowed to decompose the global technical efficiency (GTE) into Pure Technical Efficiency (PTE) and Scale Efficiency (SE). For this, it is necessary calculate two models: CRS and VRS on the same data, if there is a difference in the two measurements for a particular DMU, then it means that the DMU has scale inefficiency and inefficiency value is the difference between the CRS and VRS measurement.

Pure Technical Efficiency matches with VRS measurement. Scale inefficiency arises of producing a scale level is not optimal, considering as such the scale obtained from the efficient activity of the signatures (CRS = 1).

The Global Technical Efficiency is the product of the two efficiencies: pure technical and scale and its measurement matches with CRS.

Global technical efficiency is then represented follows:

$$GTE = ETP * SE \quad (3)$$

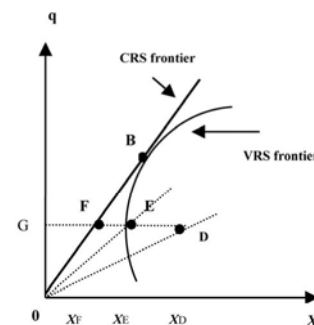
If $SE = 1$, then $ETG = ETP$, indicating that the unit has no scale inefficiency and therefore operates in an optimal scale [10]. Scale efficiency measures the impact of scale size on the productivity of a DMU (see **Figure 1**).

The scale efficiency of firm D relates to the distance from the technically efficient data point E, to the CRS technology and is equal to [11]:

$$SE = GF/GE \quad (4)$$

$$\text{and } TE_{CRS} = GF/GD \quad (5)$$

$$\begin{aligned} \text{then } SE &= TE_{CRS}/TE_{VRS} \\ &= (GF/GD)/(GE/GD) = GF/GE \end{aligned} \quad (6)$$



Source: Coelli et al, 2005

Figure 1. Scale efficiency.

After calculating the scale inefficiency, it can analyze what kind of returns are those which cause such inefficiency, if the DMU exceeds the size of production scale, and therefore presents decreasing returns to scale, or if it has returns to scale, and therefore not has reached the limit of growth provided by this situation.

Ports Efficiency

Several authors have studied the efficiency of the ports as it shows:

Eduardo Martínez-Budria, Díaz-Armas and Navarro Ibañez [12]. They analyzed the efficiency of Spanish port services, using the DEA-BCC technique and they used for inputs number of employees, quay length, surface area, labor cost, capital cost and number of passengers and for outputs: containerized cargo, general bulk cargo, liquid bulk, solid cargo bulk, income payment area and Payment for private users.

Park and De [13] realized an analysis of port efficiency using the DEA-CCR model and DEA-BCC in Korean ports. They used for inputs berthing capacity, cargo handling capacity, profitability and Revenues for outputs they used loading throughput, number of vessels, commercialization, global throughput, customer satisfaction. The study finds that alternative DEA is a potentially powerful approach to the evaluation of the overall efficiency of seaports.

Ramón Sala, Molinos-Senante and Amparo Medal [14] analysed the efficiency of 28 Spanish ports using a non-radial DEA model: the Russell Measure. They used for inputs quay length, surface terminal, number of cranes and number of employees and for outputs: number of full containers 20', number of empty containers of 20', number of full containers of 40', number of empty containers of 40'. They used this methodology in order to obtain the efficiency score for each of the inputs analyzed. As results of the analysis, they concluded that the Spanish Port System has generally a high average level of efficiency but it could grow around 20% to consider that all ports operate on the efficient frontier.

Cullinane *et al.* [15] studied the technical efficiency of port container terminal, using the DEA model CCR and DEA-BCC too. They used for inputs Terminal length, terminal area, quayside gantry, yard gantry and straddle carrier and for outputs they used Containers throughput. The paper presents the pros and cons of port privatization and provides an empirical examination of the relationship between privatization and relative efficiency within the container port industry.

Joyce Low [16] realized a study to provide an assessment on the required waterside and quayside capacity of 23 major Asian ports and estimate their inefficiency cost associated with excess capacity. She applied an integrated suite of DEA models (CCR, BCC, SBM, Congestion and

Measure-Specific) to measure the efficiency in the ports. The application of an integrated suite of DEA models enables more insights to be gleaned and better result validation, since ports differ in terms of their scale of operations, output demand and natural endowments. The findings from this research show that ports in Asia are generally characterized by constant or increasing returns to scale.

3. Methodology

Model Specifications: In the measurement of technical global efficiency, we works the Constant Returns to Scale (CRS) and Variable Returns to Scale (VRS) DEA models, with output-oriented because it is intended to analyze the possibility of maximizing the number of TEUs¹ with the inputs you have.

One calculates the technical global efficiency, as well as pure technical and scale efficiency, that the Decision Making Units (DMU's) have had. The sample ports are those that moved containers during the period 1982-201. They are ports of Mazatlan, Manzanillo, Lazaro Cardenas, Altamira, Tuxpan, Veracruz, Progress and Salina Cruz. It is necessary also to consider that the number of DMUs must be at least two times the total number of inputs and outputs considered [17]. In this research inputs used are: dock length and number of employees and outputs: number of TEUs handled annually (see **Table 1**).

In order to obtain data that model the production function, different sources were used:

- 1) Statistical yearbooks of ports in México in the Section Container Movement Coordination Ports and Merchant Marine SCT [18],
- 2) Port's development plans for selected periods.

4. Results and Discussion

In general there was a low global technical efficiency in the port sector in Mexico during the period under study. However, the port of Manzanillo stands out as it is efficient for the period 2000-2010, while the ports of Lazaro Cardenas and Veracruz, although efficient for some years are not known for having continuity in this indicator. In the particular case of Lazaro Cardenas in 2000, was minimal movement of containers that had compared to other years, which led to the fact that it had the lowest level of efficiency in the figures obtained for this port. Tuxpan, Salina Cruz and Mazatlan are in a difficult position in terms of technical global efficiency, not only for its steep downward trend but for their minimum values on measures of efficiency (see **Table 2**).

¹Twenty-foot equivalent unit (TEU) it is used to describe the capacity of container ships and container terminals. It is based on the volume of a 20-foot-long.

Table 1. Number of containers handled at the ports of Mexico 1982-2010.

	1982	1990	1995	2000	2005	2010
Mazatlan	2611	4086	10,012	16,813	17,559	25,795
Manzanillo	3133	32,792	86,938	426,717	872,386	1,511,378
Lázaro Cárdenas	2088	24773	55,109	752	132,479	796,023
Altamira	14,620	55,093	102,996	182,545	324,601	488,013
Tuxpan	18,066	1020	391	104	15	18
Veracruz	33,575	110,019	222,959	540,014	620,858	661,653
Progreso	82	3125	11,545	56,581	71,769	56,434
Salina Cruz	12,009	20,311	14,404	5413	922	5432

Source: General Coordination of Ports and Merchant Marine, 2012.

Table 2. Global technical efficiency in ports of México 1982-2010.

	1982	1990	1995	2000	2005	2010
Mazatlán	0.2946	0.1649	0.1856	0.1081	0.0635	0.1394
Manzanillo	0.3142	0.4633	0.5259	1	1	1
Lázaro Cárdenas	0.5982	1	1	0.0087	0.3451	1
Altamira	0.733	0.7784	0.623	0.4449	0.4031	0.505
Tuxpan	1	0.0432	0.0079	0.0012	0.0001	0.0002
Veracruz	1	0.876	1	1	0.647	0.5892
Progreso	0.0247	0.1147	0.2095	0.5304	0.3291	0.349
Salina Cruz	0.7373	0.4304	0.2751	0.0534	0.0044	0.0236

Source: Personal compilation based on DEA results.

Subsequently it performed global technical efficiency (GTE), disaggregated into technical pure efficiency (TPE) and efficiency scale (ES). The results allow us to distinguish situations in which a production unit may be technically efficient but not placed in the optimal scale of production.

By 1982, the most efficient ports were Tuxpan and Veracruz, as both pure technical efficiency and scale efficiency had the highest weight. They could use a smaller amount of inputs required to meet demand, plus they had an optimal production scale. On the opposite side are Mazatlan, Manzanillo, Altamira and Salina Cruz, who were not efficient in any of the categories considered. The port of Progreso although proved to be technically efficient in the area of pure efficiency, was not placed in the optimal scale of production (see **Table 3**).

In the year 2010 the ports of Manzanillo and Lazaro Cardenas are the most efficient in both pure and scale efficiency. Tuxpan was the one that had the lowest technical global efficiency score, this was due to substantially decreased the number of TEUs, reflecting the efficiency of very small scale, although in pure technical efficiency

it was shown to be efficient.

4.1. Benchmarking

With Benchmarking analysis one identifies the DMUs that are considered as a reference for the inefficient DMUs, having similar characteristics. It is observed that both in the year 1982 and 2010, the Port of Lazaro Cardenas is the one most often taken as the reference port. The ports of Mazatlan, Manzanillo, Altamira and Salina Cruz were less efficient ports in 1982, so one makes reference to Lazaro Cardenas, Tuxpan and Veracruz. Already in 2010, the most inefficient ports took to Manzanillo and Lazaro Cardenas as reference (see **Table 4**).

4.2. Slacks Analysis

The analysis of the slacks variables, allows you to see where you can make further reduction on some factor or increasing the output. In 2010, 50% of the ports had excess workers. Specifically Mazatlan cut 18 workers needed in 1982 and 30 in 2010 to be more efficient. In

the case of quay length for 1982 the port of Manzanillo and Altamira had 134.06 and 48.14 meters wasted respectively while the port of Salina Cruz in 2010 had

178.92 meters unused. It would have been more efficient to use this input at its full strength (see **Table 5**).

The most important contribution in this study is that it

Table 3. Efficiency in ports of México 1982-2010.

Port	1982			2010		
	GTE	TPE	ES	GTE	TPE	ES
Mazatlán	0.2946	0.794	0.3711	0.1394	0.3061	0.4554
Manzanillo	0.3142	0.4501	0.6979	1	1	1
Lázaro Cárdenas	0.5982	1	0.5982	1	1	1
Altamira	0.733	0.7753	0.9454	0.505	0.5543	0.9109
Tuxpan	1	1	1	0.0002	1	0.0002
Veracruz	1	1	1	0.5892	0.7428	0.7931
Progreso	0.0247	1	0.0247	0.349	0.989	0.3528
Salina Cruz	0.7373	0.8026	0.9186	0.0236	0.2765	0.0852

Source: Personal compilation based on DEA results.

Table 4. Benchmarking analysis of the port sector in Mexico 1982-2010.

Port	1982	2010
Mazatlán	3 (0.97) 5 (0.03)	3 (0.11) 5 (0.89)
Manzanillo	3 (0.97) 6 (0.03)	2
Lázaro Cárdenas	3	3
Altamira	3 (0.6) 6 (0.4)	2 (0.12) 3 (0.88)
Tuxpan	5	5
Veracruz	6	2 (0.13) 3 (0.87)
Progreso	7	3 (0.07) 5 (0.93)
Salina Cruz	3 (0.68) 5 (0.02) 6 (0.31)	2 (0.01) 5 (0.99)

Source: Personal compilation based on DEA results.

Table 5. Slacks variables analysis 1982-2010.

Port	1982			2010		
	Quay length	Workers	Teus	Quay length	Workers	Teus
Mazatlán	0	18.61	0	0	30.01	0
Manzanillo	134.06	0	0	0	0	0
Lázaro Cárdenas	0	0	0	0	0	0
Altamira	48.14	0	0	0	12.7	0
Tuxpan	0	0	0	0	0	0
Veracruz	0	0	0	0	97.54	0
Progreso	0	0	0	0	16.27	0
Salina Cruz	0	0	0	178.92	0	0

Source: Personal compilation based on DEA results.

presents an analysis of the efficiency of container terminals in Mexico, which has not been done in the way presented in this work, one of the main differences is the study period (1982-2010) which includes both stage where it was managed entirely by the government as the stage where there was already interventionism on the part of private. On the other hand besides indicating the level of efficiency of ports showing pure, scale and global efficiency, we present a benchmarking analysis in order to identify those ports that are inefficient and they were compared to other ports with similar characteristics and that are efficient and finally with slack analysis shows the number of inputs that must reduce to be more efficient.

5. Conclusions

We have introduced the measurement of global technical efficiency Mexican ports in the period 1982-2010, which in turn can be decomposed into pure technical efficiency (PTE) and scale efficiency (ES).

In this research, we work the CRS and VRS DEA model of output oriented. Input needs to consider quay length and the number of workers, while output needs to consider the number of containers handled annually. The hypothesis is true, since the results show that on average the ports have a global low technical efficiency because most ports show a reduced scale efficiency.

Tuxpan and Veracruz were ports that had a higher global technical efficiency in the year 1982. This was due to the fact that production scale remained at its maximum scale operating efficiently as shown in **Table 2**, as well as its resources properly optimized, thereby realizing pure technical efficiency. The port that is characterized by having the lowest efficiency in the period was Progreso, despite having a high level of pure technical efficiency. In 2010, Manzanillo and Lazaro Cardenas were ports with the great global technical efficiency while Tuxpan was the one that obtained less efficiency, mainly because in that year they moved only 18 containers.

With Benchmarking analysis, one is able to identify efficient ports that served as reference to the inefficient, with the ports of Manzanillo and Lazaro Cardenas referenced in the year 2010. In Slacks analysis, there must be 50% of the ports for this year that had a surplus of workers, making it necessary to rethink hiring, where profiles are evaluated as indicated for the management of these terminals, and also to have ongoing training in technological areas as is true today the port of Manzanillo.

It is generally observed that the ports of Mexico are inefficient mainly due to the poor results on the efficiency of scale, which tells us that they are at the optimal scale of production. As a matter of public policy, it is necessary that they encourage that increased containers

are moved through investment policies for the procurement of infrastructure and equipment that meet the required demand for there to be a better scale of production and in turn to have a global efficiency technique.

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Factors Influencing Consumers' Online Repurchasing Behavior: A Review and Research Agenda

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ABSTRACT

With the rapid development of E-commerce activities, it is of critical importance to identify the determinants of repurchase intention to both researchers and practitioners. This research attempts to explain the relationship between online shopping businesses and customers by testing the model incorporating the mechanisms of perceived value, satisfaction, and consumers' repurchase intention.

Keywords: Customer Perceived Value; Satisfaction; Switching Barriers; Repurchase Intention

1. Introduction

Web-based services have low entry barriers by its nature. If one service is created, a number of comparable alternative web-based services follow, resulting in a high switching rate between those services by users [1]. Thus, shopping sites' providers are very eager to identify the conditions that lead to long-running shopping sites. Accordingly, continuance intention has become an important subject of study in the consumer behavior research area in E-commerce.

The competitive advantage of E-commerce is obtained from customer loyalty and retention for repeat purchases [2,3]. Thus, the identification of determinants of repurchase intention is of critical importance to both researchers and practitioners. However, according to previous research of Hellier *et al.* [2] on consumer, repurchase intention has been largely fragmented, and few studies have tested a structural model based on a verified framework. Recently, researchers called for more efforts in order to better understand customer behavior for online shopping [4,5]. On the one hand, this research attempts to explain the relationship between Internet shopping businesses and customers by testing the model incorporating the mechanisms of perceived value, satisfaction, and behavior (repurchase intention). On the other hand, it takes cus-

tomers' repurchase intention as the final output variables.

2. Literature Review

2.1. Customer Perceived Value

The study of customer perceived value is becoming significantly more important, both in research and in practice. Scientists and practitioners have recognized the power of the customer perceived value concept in identifying value for customers and managing customer behavior [6,7]. The goal of customer perceived value research is to describe, analyze, and make empirically measurable the value that companies create for their customers and to link these insights to further marketing constructs.

Customer perceived value is defined as "the customers overall assessment of the utility of a product, based on perceptions of what is received and what is given" [8]. In the satisfaction literature, equity theory considers the ratio of the customer's perceived outcome/input to that of the service provider's outcome/input [9]. Perceived value is regarded as a better variable for prediction of repurchase intention than customer satisfaction [10], because the perception of value is the overall assessment of the benefit received from the product or service depend on gain-and-lost assessment and interpreted it as the perception of value [11].

The level of perceived value can be measured in two

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major approaches. The first one defines perceived value as a construct comprised of two parts, one is benefits received and the other is the sacrifices made [10,12]. The benefits component include the perceived quality of service and a series of psychological benefits [8], and sacrifices component includes monetary and non-monetary factors such as time, risk and convenience [12]. The second approach defines customer perceived value as a multidimensional construct by Woodruff; Sweeney & Soutar; Roig *et al.* [13-15]. Sheth *et al.* [16] defined perceived value as a multidimensional construct composed of five core values which are social, emotional, functional, epistemic and conditional.

2.2. Customer Satisfaction

Customer satisfaction studies remain the single largest category of marketing research, demonstrating the practical importance of this construct. In marketing research, various models and theories have been developed in order to define and explain the cumulative satisfaction, measuring it as the general level of satisfaction based on all experiences with the firm. A satisfied customer is viewed as indispensable means of creating sustainable advantage in the current competitive environment [17].

Customer satisfaction is generally defined in the marketing literature as the discrepancy between a customer's expectations and perceptions [18,19]. In this viewpoint, customer satisfaction is delineated as the consumer's evaluation that products or services meet or fall to meet the customer's expectations [20,21]. Moreover, "satisfaction is a judgment that a product or service feature, or the product or service itself, provided (or is providing) a pleasurable level of consumption-related fulfillment, including levels of under or over-fulfillment" [19]. Choi [22] also mentioned that "one simple approach to the concept of customer satisfaction is to understand it as a perceived value".

In recent years, most researchers consider that satisfaction is a combination of cognitive and affective response to service encounters. The satisfaction literature is focused on the nature of the cognitive and affective processes that result in the consumer's state of mind referenced to as satisfaction [23]. The cognitive dimension is individuals' accumulate information from direct or indirect experience, while the affective dimension is his positive or negative evaluation [24]. According to this stream of satisfaction research, past literature has concentrated on describing satisfaction by the consumers' evaluation. Yi [21] categorized customer satisfaction definitions either as an evaluation process or as an outcome of evaluation process. Yi [21] and Fornell [25] describe satisfaction as an evaluation process where as Tse and Wilton [26] describes satisfaction as an outcome of evaluation process.

2.3. Switching Barriers

Jones *et al.* [27] considered that switching barriers are factors that make it difficult or costly for a customer to change service providers. These factors include three types of switching barriers: strong interpersonal relationships (the strength of the personal bonds that may develop between the employees of a supplier and the customer), high switching costs (the customers perception of the time, money and effort associated with changing supplier) and attractiveness of alternatives, which refers to whether viable alternatives exist in the market. Ping [28] also classified switching barriers into three factors: alternative attractiveness, switching cost, investment in a relationship.

Kuisma *et al.* described switching barriers include search costs, transaction costs, learning costs, loss of loyal customer discounts, loss of established habits and relationships, and risk of the unknown [29]. Switching costs are not only economic in nature [1], but also can be psychological and emotional [2]. Factors influencing switching costs vary in accordance with the type of products, businesses, and customers. Gruen *et al.* [30] used the term "continuance commitment" as a measure of the extent to which a buyer was psychologically bound to a seller. This constraint-based force binds the consumer to the e-retailer out of need [31]. Essentially, this type of determinant constitutes a form of dependence and reflects the consumer's awareness that changing to another online store would involve considerable switching costs. Burnham *et al.* [32] suggested that switching barriers prevented switching when there was a negative situation, such as a temporary decline in service quality. The barriers allow time for the provider to rebuild to higher satisfaction levels.

2.4. Repurchase Intention

In this study, we examined online repurchase intention instead of studying the online consumers' actual behavior because, based on the theory of reasoned action proposed by Ajzen and Fishbein [33]. Intention is considered the best immediate factor in the relationship between attitude and behavior, it is affected by attitude and subjective norms, and is appropriate to test consumers' behavior. This implies that behavior is decided by individual intention. Online customer retention is a hot issue in marketing areas. Researchers have studied online customer retention in different contexts, such as "online repurchase intention" Khalifa, M. [34], "Continue to shop online" [35] Mouakket, S., and so on.

Definition of repurchase intention, different scholars have different views. In this study, customer repurchase intention is defined as the individual's judgment about buying a service again, the decision to engage in future

activity with a service provider and what form this activity will take [2,36].

Scholars have focused on different aspects of repurchase intention. For example, regarding the underlying logic of the ECT model as described by Oliver [37] and Bhattacharjee [38,39], the model posits that confirmation and satisfaction are the primary determinants of the intention to repurchase. Jones [40] considered that switching barriers directly affect repurchase intention. Customers' repurchase intention depends on the value obtained in their previous transactions [41] such as: appropriate performance criteria (benefits), competition, and cost considerations.

3. Hypothesis and Research Model

3.1. Customer Perceived Value and Customer Satisfaction, Switching Barriers, Repurchase Intention

Woodruff [13] argues that perceived value represents customer cognition of the nature of relational exchanges with their suppliers, and satisfaction reflects customers' overall feeling derived from the perceived value. On the basis of the behavioral model [33], affect is significantly influenced by cognition. And empirical evidences show that customer-perceived value has a positive effect on customer satisfaction with a supplier [42]. Thus, it is proposed that:

H1. Customer perceived value is positively associated with customer satisfaction.

The evaluation of value is subjective in nature [43]. Consumers judge stimuli against purchase expectations and desire to determine a net value outcome [13,44]. The customer value focuses on high quality and/or low price compared to alternatives. A price-quality comparison is often viewed as a critical determinant to purchase decisions and switching behavior [41], and consequently, can create strong exit barriers. In other words, as buyers perceive that they are getting a better deal (*i.e.* better economic value, or higher quality, or lower price compared to competitors), they will perceive the costs associated with switching from this supplier as being higher.

H2. Customer perceived value is positively associated with switching barriers.

Scholars and researchers have been continually interested in perceived value which brought about widely distribution of research and study literatures in various journals such as: Journal of Marketing Research [12], Journal of Retailing [10], Journal of Travel Research [45] and similar to many other scholars [46,47], in which explained that perception of value had positive influence on repurchase intention. According to Arch, Lise & Robert [48], and Zeithaml [8], their studies also show that customer perceived value takes positive effect on customer

satisfaction and customer repurchase intention.

H3. Customer perceived value is positively associated with repurchase intention.

3.2. Customer Satisfaction and Repurchase Intention

Future purchase intentions have a relationship with customer satisfaction [49,50]. Customer satisfaction is an antecedent of repurchases intention. Customers evaluate future purchase intentions based on the value obtained from previous experiences, with relationship benefits, as a proxy for expectations of future benefits.

In general, that number of previous researches can be found that there is a strong, positive relationship between satisfaction and repurchase intentions. (e.g. Anderson and Fornell [51], Rust and Zahorik [52]). It can be confirmed that satisfied consumers are more likely to buy again or to buy more in future transactions than dissatisfied customers (e.g. Reichheld [53], Michael [54], Nigel & Jim [55] believe that the improvement of customer satisfaction will increase customer repurchase intention, and customer satisfaction is the antecedents of the customer repurchase intention and it can make a certain degree of interpretation of the customer repurchase intention).

H4. Customer satisfaction is positively associated with repurchase intention.

3.3. Switching Barriers and Satisfaction, Repurchase Intention

In recent years, numerous studies in the service sector have proposed and empirically validated the association with customer satisfaction and behavioral intentions such as customer revisit and switching intentions [10]. Cronin *et al.* [10] empirically tested the significant linkage between customer satisfaction and switching intention. The research of Lund [56] shows that barriers may enhance the probability of remaining in a social relationship. She found that the barrier variables were better predictors of whether a romantic relationship would continue than the positive pull variables. In addition, some scholars consider that, as a key moderating variable, switching costs can significantly influence customer loyalty through the determinants such as customer satisfaction [17,57,58], and perceived value [13]. Therefore, we proposed:

H5. Customer satisfaction is positively associated with switching barriers.

Several conceptual and empirical studies have posited switching barriers as a key determinant of repurchase intentions. Wathne *et al.* [41], drawing on economic sociology literature, suggested that switching providers would mean sacrificing the utility of an existing relationship. Therefore, switching barriers would be a psychological loss that customers do not want to incur. Fur-

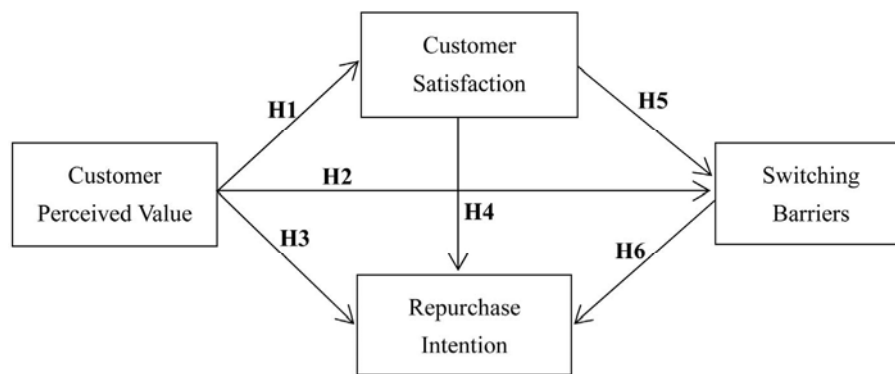


Figure 1. Research model.

thermore, a study of Jones *et al.* [40] provided empirical support for the view that consumers who felt “locked in” were more likely to remain with a provider. Therefore, we proposed:

H6. Switching barriers is positively associated with repurchase intentions.

The relationship of variables as hypothesized is depicted in the **Figure 1**.

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Research on Routing Optimization of Regional Logistics Based on Gravity Model: A Case of Blue and Yellow Zones*

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ABSTRACT

The structure is the basic attribute of everything. The structure of logistics network is composed of logistics nodes and logistics routes, however the logistics cost mainly happens on the function the logistics route undertakes. So logistics routing optimization is the key to reduce logistics cost. As logistics is the hygiene factor of regional economic development, this article studied on logistics routing optimization by applying the demand of the regional economic development as a starting point, using the spatial interaction theory, building a method of the regional logistics link optimization based on the gravity model, and taking blue and yellow zones as the background to illustrate the rationality and feasibility of this method.

Keywords: Gravity Model; Routing Optimization; Blue and Yellow Economic Zones; Logistics Network

1. Introduction

Logistics is the hygiene factor of social and economic development, so the regional logistics must meet the demand of the regional economic development. As a basic economic activity, logistics is also one of industries constituting the regional economy. Seen in this light, the logistics of the regional economic development is not only a hygiene factor, but also an incentive factor of the regional economic development. So first of all, logistics should be set as the security condition of the regional economic development and secondly it can be an industry as a key support in the area with logistics advantages.

Structure is the basic attribute of everything. According to the system science, it is relatively stable contact way of the inherent manifestations of organizational procedures and temporal relationship between the various elements within the system. Logistics network structure is the basic problem of the logistics network. It is composed of logistics nodes and logistics routes. Logistics nodes assume the function of logistics pauses while logistics routes assume the function of logistics spatial transference, logistics activities of transport and delivery

carried out on the routing distribution, and transportation costs account for a majority of logistics costs, so the logistics routing optimization is the key to reduce logistics costs [1]. Based on the logic above, this article proposed ideas and methods of optimizing logistics routes by using the spatial interaction theory and demonstrated the practicality and feasibility of this method through analyzing the case of logistics routing optimization of blue and yellow zones.

2. Theoretical Basis

Regional logistics should be able to meet the needs of regional economic development at first based on the relationship between regional logistics and regional economy. Region involves a number of economies, the spatial interaction theory is a basic theory of explaining economic spatial linkage between economies, it mainly studies on locating potential energy, regional polarization and diffusion mechanism, spatial interaction model as well as the change and effect of factor flow. This theory can be used to explain whether the association exists, association strength and how to associate relevance between cities, between city and region, between regions, in addition the influence and influencing factors of the association strength and association way in the spatial system.

The gravity model is a mathematical expression of the

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spatial interaction theory. Gravitational interaction between cities is a key element of the gravity model. The urban flow is the economic activity generated by connection outside and the intensity of the urban flow is used to measure the connection of city from the outside world. The intensity of urban flow refers to the energy generated by urban extroverted function (agglomeration and radiation) and the number of mutual influence relations between cities. In this paper, we adopted the urban flow intensity to represent the force between single city and its adjacent city. Specific formula is:

$$F = N \cdot E \quad (1)$$

F means the intensity of urban flow, N means the city functional benefit, it is the actual impact generated by unit extroverted function among cities, E means urban extroverted function, it is composed of economic activity generated by the city contacting with the outside world.

Considering the representation of indicators and data availability, this paper adopts the practitioners engage in export-oriented economic activity as indicators of the amount of urban functions. It is represented by the location quotient engaging in export-oriented economic activity. Specific formula is:

$$Lq_{ij} = \frac{G_{ij}/G_i}{G_j/G} (i=1,2,\dots,n; j=1,2,\dots,m) \quad (2)$$

If $Lq_{ij} < 1$, city i department j do not have external function, $E_{ij} = 0$; If $Lq_{ij} > 1$ city i department j do have external function, because the allocation proportion of practitioners exceed the national allocation proportion, it can provide services outside the city area. Thus, the external function of city i department j can be expressed as:

$$E_{ij} = G_{ij} - G_i (G_j/G) \quad (3)$$

So the total amount of extroverted function of m departments in city i E_i is:

$$E_i = \sum_{j=1}^m E_{ij} \quad (4)$$

The function efficiency of city i can be expressed by GDP per capita:

$$N_i = GDP/G_i \quad (5)$$

So the intensity of urban flow of city i is:

$$F_i = N_i \cdot E_i = (GDP_i/G_i) \cdot E_i \quad (6)$$

Defining the distance is another key factor of the gravity model, under the condition of market economy, the distance has alienated to the combination concept of monetary cost and time cost. Therefore, distance can be expressed as [2]:

$$d_{ij} = \sqrt{\sum_{i=1}^n \lambda_{ij} c_{ij} T_{ij}} \quad (7)$$

Including i means the i th way of transportation between i and j ; λ_{ij} means the weight of the i th way of transportation between i and j ; c_{ij} means the monetary cost of the i th way of transportation between i and j ; T_{ij} means the time cost the i th way of transportation between i and j .

3. Study Design

The general idea about routing optimization of regional logistics can be summarized as: The regional logistics routing optimization should be based on the logistics demand volume, according to the logistics demand volume, we can determine the regional logistics demand, then determine the supply ability of regional logistics route in light of the road traffic conditions. In the end, optimization recommendations can be put forward based on the matching of demand and supply situation of logistics route.

3.1. Logistics Demand Analysis

Regional logistics demand should include two parts, the first is to grasp the current logistics demand, and the second is the logistics demand forecast for the future. Considering the regional logistics demand is in order to meet the needs of the development of regional economy at first. When it comes to intra-region or inter-city, its logistics flow in a certain degree can represent the strength of the association between cities or within region, and the gravity model which belongs to the spatial interaction theory can reflect the strength of the association between cities or within region in order to measure the correlation between cities in the region. Then we can use the industrial structure analysis method (location quotient) to study the leading industry of the cities in the area, according to the leading industry to determine the main city logistics functional requirements, finally, analyzing the relation between the city industry cooperation to determine the city logistics demand at present, also in the future by setting high degree of correlation city as the object.

3.2. Investigation of Logistics Supply

To conduct a full investigation of the city logistics supply situation in the region, the investigation content includes the current logistics infrastructure supplies and the plans for the future supplies. Current supply situation is mainly to analyze the overview of the main logistics corridor in the region and to analyze main logistics nodes. Logistics activities of the logistics nodes are mainly concentrated in the logistics park, and the logistics node should be

highlighted in the general situation of logistics park. The future supplies mainly based on the planning of regional and intra-regional city logistics.

3.3. Optimizing Opinion

Intra-regional correlation close ties to the city industry, the logistics route supply present situation and the future plan is the basis of the regional logistics routing optimization. Experience measures suitable for this region can be refined to put forward the regional logistics routing optimization and improvement opinions through analyzing and summarizing the successful cases of international and domestic regional logistics.

4. Application Example

In 2009 the state council approved the Yellow River delta efficient ecological economic zone development planning, and in 2011 approved the Shandong peninsula blue economic zone planning. So far the integrative development of the blue and yellow economic zone has become the focus of attention from all walks of life and it is also inseparable from the support of modern logistics. So this article took the optimization of the blue and yellow zone logistics route to illustrate the applicability and feasibility of the gravity model.

4.1. Urban Gravity of the Blue and Yellow Economic Zone

Using export-oriented department practitioner index to measure the intensity of urban flow, urban flow intensity of Dongying, Weifang, Dezhou is higher, it shows that the export-oriented economy of the city, in addition to meeting the local needs and more surplus capacity to undertake external demand.

There are four main modes of transportation between cities, highway transportation, railway transportation, water transport and air transport, and yellow blue economic zone is in the range of road transportation economic mileage, a large number of transportation is assumed by road transportation in the blue yellow economic zone, so this article selected the inter-city highway as basis of the main distance. Distance formula can be expressed as:

$$d_{ij} = \sqrt{c_{ij}T_{ij}} \quad (8)$$

Including c_{ij} means the monetary cost of the road transportation between i and j ; T_{ij} means the time cost of the highway transportation between i and j .

Monetary cost of highway transportation was expressed by road freight rate, nearly three months of 218 times transport data was collected through the transportation enterprise investigation. Statistics showed that the

road freight rate floating 0.20 yuan/ton.Km nearby, of which 71% of freight rate fluctuating in the range of $0.20 + 0.02$, the concentration degree of the freight rate was higher. The remaining 29% of the data was divided into two groups, higher than the average and below average. It was found that the higher freight rate in respects of transportation distance had significant difference with the rest of the sample. Then, regression analysis was carried out on the transportation by using the transportation distance and vehicle type, etc. It was found that the coefficient of determination was as high as 95%, after the variable vehicle type added, the coefficient of determination increased less than 1%. So it can be seen that transportation cost mainly related to the transportation distance. According to the results of regression, the monetary cost of transportation is a function of the transport distance and it can be concretely expressed as:

$$c_{ij} = 0.98 * D_{ij} \quad (9)$$

Including D_{ij} means the actual physical distance between i and j .

This article used baidu map (<http://map.baidu.com>) to query the distance between i and j . As the distance was the main factors influencing the transport monetary cost, this article chose the shortest distance between i and j as query conditions when querying on the baidu map, in this way, the distance between city and city in the blue yellow economic zone can be obtained. At the same time, Shandong province traffic tourist map published by map publishing house of Shandong province in 2012 was also collected to verify the accuracy.

Vehicle running speed is important influence factor in the vehicle operating costs, and the main factor influencing the vehicle running speed is road technology level. As the roads with different technology levels have different requirements in the design of surface evenness, Slope, turning radius, the higher the road technical level is, the faster the speed is, and the greater the impact made on operating costs [3]. According to the road technology standard of the People's Republic of China (JTGB01~2003) which regulated different types of road driving speed, and combined with the blue economic zone road actual situation, set the highway 120 km/h, state road 80 km/h, provincial highway and the following road 60 km/h. The freight time (unit: h) between cities can be calculated by Using the various road mileage between each city.

According to the gravitational model of cities, setting urban flow intensity as the interaction force of each city, using the distance between the cities, computing the mutual attraction between cities, **Table 1** can be obtained.

From **Table 1**, the gravity of cities in the blue and yellow economic zone in total to Weifang, Dongying, Dezhou, Qingdao, Rizhao, Yantai, Zibo, Weihai in a de-

Table 1. Attraction between cities in blue and yellow economic zone.

City	Qingdao	Yantai	Weifang	Rizhao	Weihai	Dongying	Zibo	Dezhou
Qingdao	-	17.41	67.64	71.25	4.50	33.45	2.06	25.54
Yantai	17.41	-	19.00	8.73	30.06	12.82	0.86	8.77
Weifang	67.64	19.00	-	34.16	4.55	181.07	11.03	167.96
Rizhao	71.25	8.73	34.16	-	2.23	23.88	1.98	16.08
Weihai	4.50	30.06	4.55	2.23	-	3.53	0.26	2.47
Dongying	33.45	12.82	181.07	23.88	3.53	-	32.63	167.97
Zibo	2.06	0.86	11.03	1.98	0.26	32.63	-	32.65
Dezhou	25.54	8.77	167.96	16.08	2.47	167.97	32.65	-

scending order, after taking the city distance into account, certain differences existed in the evaluation of the sorting result with urban flow intensity. In addition, from the point of gravity between cities (such as the bold cells in **Table 1**), two big gravity group formed, one is centered in Qingdao, and the gravity linear group was composed of the gravity between Qingdao and Weifang, also the gravity between Qingdao and Rizhao. Another one made the gravity between Weifang and Dezhou, and the gravity between Weifang and motivation coherent, formed a closed gravity group through the relationships between Dongying and Dezhou. As shown in the **Figure 1**.

4.2. Urban Industries and Logistics Demand Research on Blue and Yellow Economic Zone

4.2.1. Blue and Yellow Economic Zone Primary Industry Characteristics and the Logistics Requirements

1) The primary industry characteristic industry analysis

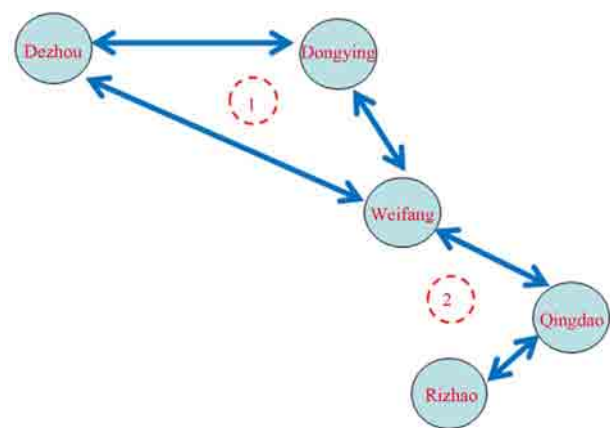
From the perspective of industry specialization and scale, Dongying and Binzhou's cotton industry, Weihai's fisheries, Rizhao's oil industry, Yantai's fruit nut beverage industry and Dezhou's livestock industry have advantage in industry specialization and scale. Although the specialization of Qingdao's fisheries and Weifang's vegetables is not very prominent, ratio exceeded 20% in the primary industry of Qingdao and Weifang. Flowers and other horticultural compared with other agricultural industry in Zibo, the scale degree is not high, but compared with other cities, professional advantages are very obvious. From this view, the leading industries of blue and yellow zone cities primary industry are respectively shown in **Table 2**.

2) Agricultural Cooperation Analysis

The first group (Weifang-Dongying-Dezhou) analysis of the agricultural cooperation: The first group composed

Table 2. City characteristic industry in the primary industry.

City	Characteristic industry
Dongying	cotton
Weihai	fishery
Yantai	fruit nut beverage
Qingdao	fishery
Zibo	flowers and other horticultural crops
Binzhou	cotton
Rizhao	oil
Dezhou	livestock
Weifang	vegetable

**Figure 1. Gravity group of blue and yellow economic zone.**

of Weifang, Dongying and Dezhou covers four cities (Weifang, Dongying, Binzhou and Dezhou), and Weifang, Dongying, Binzhou and the county Laoling and Qingyun belong to the category of yellow economic zone. In view of the situation of urban agriculture industry lo-

cation quotient in the blue and yellow economic zone, the agricultural characteristic industries of Weifang, Dongying, Dezhou respectively are vegetables, cotton and livestock. Vegetables and livestock sales link needs the support of cold chain logistics, so it is suggested that the cold chain logistics system should be established and developed in the first group (It was consistent with the cold storage needs of ecological animal husbandry industry chain which was in mentioned the Dongying 12th five-year plan). Dongying and Binzhou's cotton advantage is obvious, and the Binzhou's textile industry location quotient is higher in its secondary industry, so the integrative development of the primary industry and the secondary industry can be formed in the first group. Binzhou's textile industry should be set as the core to established industrial chain (cotton production—cotton processing—sale). The additional value of cotton can be improved through the textile and the industry chain can extend forwards and backwards. Backward can develop bamboo forest planting (Binzhou Haosheng Group which has industrial base), forward can develop clothing industry.

The second group (Weifang-Qingdao-Rizhao) analysis of the agricultural cooperation: Qingdao characteristic agriculture is fishery, it also needs the support of cold chain logistics to achieve high additional value. So the cold-chain logistics network of the first group is supposed to extend to Qingdao, Form cold chain logistics network system that its core logistics node is Weifang, main logistics nodes are Qingdao, Weifang and Dezhou.

4.2.2. Blue and Yellow Economic Zone Secondary Industry Characteristics and the Logistics Requirements

1) The secondary industry characteristic industry analysis

The proportion of each city industry in its secondary industry shows the scale of the industry in this city, and the location quotient of the blue and yellow zone shows the degree of specialization of the industry in the region. Considering the double perspective (Specialization and scale), the main industries of cities are shown in **Table 3**.

2) The secondary industry group cooperation analysis

The first group (Weifang-Dongying-Dezhou) analysis of the industry cooperation: As the degree of specialization of agricultural products and byproducts process is only 0.8, it is necessary to continue improving its industry specialization, but the specialization of industry needs a process. Therefore, in the short term, the agricultural products and byproducts processing of Binzhou need to rely on the processing capacity of Weifang.

The second group (Weifang-Qingdao-Rizhao) analysis of the industry cooperation: The black metal smelting and rolling processing industry of Rizhao have not yet been forming, the location quotient is only 0.1 which cannot be self-sufficient. And the location quotient of ferrous metals mining and dressing is 11.91. When it comes to Zibo, the location quotient is 6.02, but the location quotient of the Black metal smelting and rolling processing is 2.61. Compared with Zibo, the scale of

Table 3. Main industries of cities in secondary industry.

City	Both specialty and strength
Qingdao	Developmental Emphases: transportation equipment manufacturing industry; Electrical machinery and equipment manufacturing industrialization
Yantai	Communication equipment, computers and other electronic devices; Non-ferrous metal smelting and rolling processing industry; Developing the nonferrous metal industry acquisition and processing of industrialization
Weihai	Manufacture of Rubber, artware and other Manufacturing, Agricultural Products and Byproducts Processing; Promoting instrumentation of cultural and educational sporting goods manufacturing and cultural office machinery manufacturing scale
Rizhao	Ferrous Metals Mining and Dressing, Wood processing and products, Metal Products, Electric heat production and supply industry, agricultural Products and Byproducts Processing; Improving the degree of specialization food processing
Dongying	Petroleum and Natural Gas Extraction, Oil processing and coking and nuclear fuel processing industry, Chemical raw materials and chemical manufacturing, Rubber products Developmental Emphases: Oil production, processing and deep processing industry industrialization
Weifang	Developmental Emphases: Industrialization of agricultural food processing
Binzhou	Textiles, leather and fur feathers (fine hair) and manufacturing Developmental Emphases: Textile industry industrialization
Zibo	Chemical raw materials and chemical manufacturing; Nonmetal Mineral Products; Oil processing and coking and nuclear fuel processing industry
Dezhou	Extractive industry

Rizhao black metal smelting and rolling processing industry is too small and metal logistics cost is higher, so it is the best way to process nearby. As Rizhao is close to Qingdao, it is the lowest logistics cost strategy to choose Qingdao as downstream processing site of the black metal smelting and rolling processing.

From the perspective of the cooperation of the first group and second group, it is prominent in the first group that Binzhou cooperates with Weifang and it is the same with the cooperation of Qingdao and Rizhao in the second group. Because the distance between Binzhou and Weifang is close as well as Qingdao and Rizhao, which is in the range of road transportation economic mileage, it is necessary to strengthen the road transport capacity between Binzhou and Weifang, Rizhao and Qingdao.

4.3. The Present Situation of Logistics Supply of Blue and Yellow Economic Zone

The distance between cities in the main group which belong to the blue yellow economic zone can be obtained, as shown in Table 4.

4.4. Blue and Yellow Zone Logistics Route Optimization Suggestions

From the distance between main group cities of blue and yellow economic zone, the highway distance between two cities is shorter than the national road distance, except Weifang-Binzhou and Weifang-Dezhou. The conditions and the highest speed limit of highway are superior to the national road, so it can largely save transportation time when choosing highway. The highway between Weifang and Dezhou is equivalent to going around the two edges of the rectangle of which diagonal is Weifang to Dezhou, so the distance is longer than the national road. Therefore, we suggest establishing transverse connection between G3 Jingtai highway and G25 Changshen highway. So it can not only shorten the distance from Dezhou to Weifang, but also benefit the three cities (Binzhou, Jinan and Dezhou).

Table 4. The distance contrast between mainly contrast group cities of blue yellow zone.

City-City	Highway distance	National road distance
Weifang-Dongying	106 km	127 km
Dongying-Dezhou	219 km	254 km
Dezhou-Weifang	233 km	179 km
Binzhou-Weifang	180 km	134 km
Rizhao-Qingdao	134 km	188 km
Qingdao-Weifang	135 km	179 km

In addition, except the logistics routes, the logistics node construction should be given full consideration to the group cooperation between two cities, Such as the demand for cold chain logistics network in the group cooperation of primary industry, and the demand for railway logistics network in the group cooperation of secondary industry.

5. The Conclusion and Prospect

This article studies on logistics routing optimization by applying the demand of the regional economic development as the starting point, using spatial interaction theory, building a method of a regional logistics link optimization based on the gravity model, and taking blue and yellow zones as the background to illustrate the rationality and feasibility of this method. Supporting the economic development is only one of the goals of the regional logistics development. As an independent economic activity, logistics is also one component of regional economies. Therefore the research on logistics route optimization whose goal is the future logistics industry development has certain theoretical value and practical significance.

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An Early Warning Model with Technical Indicators: The Case of Ise (Istanbul Stock Exchange)

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ABSTRACT

In this study, the technical indicators are used in forecasting whether stock prices will rise, fall or will be constant at the following day. The indicators are generated by taking into account the daily stock returns. If the daily stock returns are positive, the indicator is coded as “+1”; if the daily stock returns are constant, the indicator is coded as “0” and at least if the daily stock returns are negative, the indicator is coded as “-1”. These indicator values express the dependent variable of ordered choice models which independent variables are technical indicators. The ordered choice models are applied to all of the stocks of ISE (Istanbul Stock Exchange).

Keywords: Stock Exchange; ISE; Technical Analysis; Technical Indicators; Early Warning; Ordered Choice

1. Introduction

The computation and interpretation of the technical indicators take place according to the methods described in the methodology. With the computation of the daily indicator value “NSI”, which represents a conclusion value as the dependent variable, the individual parameters of the respective technical indicators of a share of the technical indicators of the one day lagged are determined.

With a rising NSI (New Stock Indicator), the indicator value (+1) was assigned to the shares, which were consulted in the model category three for the computation of the new indicator value “NSI”, the shares of a constant “NSI” with the indicator value (0) and the shares of a falling “NSI” with the indicator value (-1). During the dissolution, this model was used for the dependent variables and their categorization, the Ordered Choice model, whereby lining the variable (-1), (0) and (+1) with the use of this model put up close.

The Ordered Choice methodology is used among other things with the determination by economic cycles:

How did the prices develop in the past period P_t ?

What for a price history is expected in the coming period P_t^* [1]?

King, Nerlove, Ottenwaelter and Oudiz have in their work:

- P_t^* as conditionally distributed regarded and with that

adaptive expectations model for P_{t-q}^* and P_t compared

- P_t^* as conditionally distributed regarded and with the extrapolative models for P_{t-q}^* , P_t compared.

A general error correction mechanism is used derived by using ΔP_t^* . $E(P_t)$ represents thereby the variable for ΔP_t^* for changes of expectation, is “trichotomous” and takes the following values (**Table 1**):

The computation of the Ordered Logit and Ordered Probit models is based on the Maximum Likelihood method.

Like already with the technical analysis on the basis of the conclusion values of the past periods, the future development of the conclusion values is mentioned and estimated. With this kind of the estimation, the conclusion values of shares show dependence and it becomes repetitive share price history.

The following acceptance of the model is on the basis of technical models:

- The share prices are determined by supply and demand.
- Supply and demand occur by external factors *i.e.* inflation, interest rates, exchange rates etc.
- Easy share price fluctuations are neglected; do recognize trends with the share prices.
- The changes are at trends due to changes in supply and demand.

The changes in supply and demand are responsible for

Table 1. Values of $P_t^* \setminus P_{t+1}$.

	$P_t^* \setminus P_{t+1}$	\uparrow	\Rightarrow	\downarrow
\uparrow Rising	\uparrow	=	+	+
\Rightarrow Constant	\Rightarrow	-	=	+
\downarrow Falling	\downarrow	-	-	=

the fact that it comes to the changes of trends pursued by the share prices. The technical analysts call the application of the technical analysis instead of fundamental analysis according to following reasons:

- The fundamental analysis is time-consuming and dependent to its user's economic basic knowledge. In contrast to it, the simple basic knowledge is sufficient for the application of the technical analysis. For this reason by small investors, the technical analysis is preferred. The confrontation of the investors with similar formations and indicators leads to the fact that you display homogeneous actions and because of these actions, supply and demand are affected.
- The fundamental analysis helps to become attentive on shares with low prices and to make plans possible into this security. The success of such a plan depends on the fact that the remaining investors become attentive to these shares and their offers thus increase, so that it comes by it to share price increases.
- Users of the technical analysis are not on those balances and success estimations, which are however not set up after according to tax law principles the actual costing and yield structure to again-reflect, instructed.
- The results of the fundamental analysis illustrate the central to long-term price change. With the technical analysis, it is possible to use short term data in investment decisions.
- Speculative price history is not illustrated with the fundamental analysis. The technical analysis is proved with speculative shares as particularly sensitive to the analysis method. Speculations lead to the revaluation of shares, whereby the financial indicators at force of expression lose.

2. Methodology: Ordered Choice Models

The many of the Multinomial Choice variables are automatically arranged. In the literature the following examples are called: [2]

Security evaluations [3];

Results of sample tests;

Public opinion polls;

Dispatching from military personnel to place qualifications after qualification level;

Election results with certain programs.

In requirement taken insurance level by consumers: no partial, full demand Occupation: Full employment, part-time work, unemployment.

At all these cases, although the result is discrete, the Multinomial Logit and Probit models would fail to the dependent variable with ordinal nature. Usually regression analyses are into the opposite direction. If one regards for example the result of sample tests or a public opinion poll, then arises: if the effect with 0, 1, 2, 3 or 4 is coded, the linear involution represents the difference between 4 and 3, equal the difference between 3 and 2.

The Ordered Probit and Logit of models finds a strong use as an analysis stand (Zavoina and McElvey, 1975) [4]. The Ordered Probit model is set up, like the Binomial Probit model, for a latent involution.

The initial equation reads:

$$y^* = \beta'x + \epsilon$$

Usually y^* the non-observed variable represents. It represents a form of the censorship. One observes:

$$y = \begin{cases} 0 & \text{if } y^* \leq 0 \\ 1 & \text{if } 0 < y^* \leq \mu_1 \\ 2 & \text{if } \mu_1 < y^* \leq \mu_2 \end{cases}$$

Those μ are unknown parameters, also β become estimated. During the view of a public opinion poll we can see that all asked persons have their own feeling intensity, those from the measurable factors x and did not determine not observed factors ϵ depend. They can answer to the questions with their own y^* , if this is permitted. With five possible answers for example given, they select that one, which corresponds to its feelings during the given question at most [5].

Assumed ϵ is normal distributed with constant variance. From the same reasons as in the binomial probit model (special case $J = 1$), becomes the average value and the variance of ϵ to 0 and 1 normalizes. The model can be distributed also with a logistically distributed disturbance. This trivial modification of the formula does not seem to make a real difference in practice.

The following probabilities result in the case of normal distribution:

$$\text{Prob}(y = 0) = \Phi(-\beta'x)$$

$$\text{Prob}(y = 1) = \Phi(\mu_1 - \beta'x) - \Phi(-\beta'x)$$

$$\text{Prob}(y = 2) = \Phi(\mu_2 - \beta'x) - \Phi(\mu_1 - \beta'x)$$

For all positive probabilities is the result

$$0 < \mu_1 < \mu_2 < \dots < \mu_{J-1}$$

Figure 1 shows the effects of the structure. It is a generalized case of the probit of model represented above. The log Likelihood function and its derivative can be

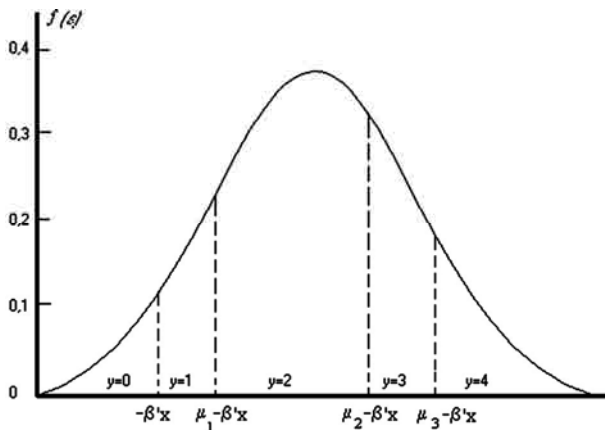


Figure 1. Probabilities with ordered probit models.

easily determined. The optimization takes place as usual.

The marginal effects of the Regressors x are not alike for the determined probability and the coefficients. For example there are three categories. The model exhibits an unknown border parameter. The three probabilities read:

$$\text{Prob}(y = 0) = 1 - \Phi(-\beta'x)$$

$$\text{Prob}(y = 1) = \Phi(\mu - \beta'x) - \Phi(-\beta'x)$$

The marginal effects of the change of Regressors for the three probabilities read: [2]

$$\frac{\partial \text{Prob}[y = 0]}{\partial x} = -\phi(\beta'x)\beta$$

$$\frac{\partial \text{Prob}[y = 1]}{\partial x} = [\phi(-\beta'x) - \phi(\mu - \beta'x)]\beta$$

$$\frac{\partial \text{Prob}[y = 2]}{\partial x} = \phi(\mu - \beta'x)\beta$$

Figure 2 shows the effect of the change of Regressors. The probability distribution of y and y^* is represented in the pulled through curve. An increase of x , during β and μ to be kept constant, is to the right, represented as broken curve equal a shift of the distribution. The effect of the shift is a concentration on those completely left cell.

With the acceptance that β for this x , must $\text{Prob}(y = 0)$ is positive sink. Alternatively to the previous expression, the derivative of $\text{Prob}(y = 0)$ has the contrary sign for β . With a similar logic the change knows case] the same sign with $\text{Prob}(y = 2)$ [or $\text{Prob}(y = J)$ generally how β have. On the assumption that it is positive, it shifts the probability into the right cell. Which passed it with the middle cell unclearly, depends on the two densities. Generally, in dependence to the signs of the coefficients, only the changes of $\text{Prob}(y = 0)$ and $\text{Prob}(y = J)$ are unclear. In summary it can be said that the interpretation of the coefficients must be accomplished in this model very carefully. With the models represented above it acts up to now around to few clear model. Without an appropriate

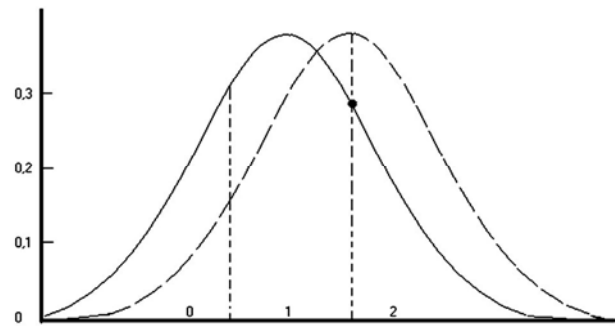


Figure 2. Effects of the change of x with forecast probabilities.

number of computations the kind of the interpretation of coefficients is not clear in Ordered Probit models [2].

3. Technical Indicator Variables and Models

In the table, Ordered probit is used for the indicators as presented into the individual models as argument. A new indicator “NSI R” (NSI REAL) is computed, which represents the daily conclusion values of the individual shares. The indicator “NSI C” (NSI calculated) is determined with the help of down stated the formula for all at the IMKB noting 250 shares and from it a “NSI E” (NSI Estimated) is derived.

$$\begin{aligned} \text{NSIE}_t = & \beta_{\text{CCI}} \cdot \text{CCI}_{t-1} + \beta_{\text{OSILATOR}} \cdot \text{OSILATOR}_{t-1} \\ & + \beta_{\text{PVT}} \cdot \text{PVT}_{t-1} + \beta_{\text{ROC}} \cdot \text{ROC}_{t-1} \\ & + \beta_{\text{VOLUME}} \cdot \text{VOLUME}_{t-1} \\ & + \beta_{\text{MACD}} \cdot \text{MACD}_{t-1} + \beta_{\text{MOMENTUM}} \cdot \text{MOMENTUM}_{t-1} \\ & + \beta_{\text{RSI}} \cdot \text{RSI}_{t-1} + \beta_{\text{VOLOSIL}} \cdot \text{VOLOSIL}_{t-1} \\ & + \beta_{\text{WILLIAMS}} \cdot \text{WILLIAMS}_{t-1} + \beta_{\text{NSIE}(-1)} \cdot \text{NSIE}_{t-1} \end{aligned}$$

The following technical indicators were consulted for the models (**Table 2**).

In the Ordered Probit tables under the parameter estimated values the standard errors are bold indicated. For those shares without parameter estimated values, the parameter estimations are not efficient.

The estimated parameter values of the technical indicators state above for all shares that computed. They represent the argument in each case in the individual models. From the dependent variable “NSI R” is determined the indicator “NSI C” and derived from it with the help of that far down aforementioned method the indicator “NSI E”. This indicator can accept the “NSI R” with the comparison with values the values (+1) for rising, (0) for constant and (-1) for falling prices.

With the computation of the estimated parameter values the Ordered Choice models (Ordered Logit models and Ordered Probit models) is used. In the theoretical part the Ordered Choice methodology is described in detail. During the derivative of the indicator “NSI P” from the indicator “NSI E” the following method is used:

Table 2. Technical indicators variables.

CCI	Commodity channel index	OSILATOR	Stochastic oscillator
PVT	Price volume trend	ROC	Rate of change
VOLUME	Acted quantity	MACD	Macd
MOMENTUM	Momentum	RSI	Relative strenght index
VOLOSIL	Volume Oscillator	WILLIAMS	Williams % R
NSI (-1)	NSI one day lagged		
LR Index (Pseudo-R ²)		LR Statistic	Probability (LR stat)

$$Y_i^* = \beta x' + \varepsilon \quad (1)$$

$$Y_i = \begin{cases} -1 & \text{when } Y_i^* \leq \gamma_1 \\ 0 & \text{when } \gamma_1 < Y_i^* \leq \gamma_2 \\ 1 & \text{when } \gamma_2 < Y_i^* \end{cases} \quad (2)$$

$$\Pr(Y_i = -1 | x_i, \beta, \gamma) = \phi(\gamma_1 - x' \beta)$$

$$\Pr(Y_i = 0 | x_i, \beta, \gamma) = \phi(\gamma_2 - x' \beta) - \phi(\gamma_1 - x' \beta) \quad (3)$$

$$\Pr(Y_i = 1 | x_i, \beta, \gamma) = 1 - \phi(\gamma_2 - x' \beta)$$

$$\begin{aligned} \ell(\beta, \gamma) = & \sum_{i: Y_i = -1} \log(\Pr(Y_i = -1 | x_i, \beta, \gamma)) \\ & + \sum_{i: Y_i = 0} \log(\Pr(Y_i = 0 | x_i, \beta, \gamma)) \\ & + \sum_{i: Y_i = 1} \log(\Pr(Y_i = 1 | x_i, \beta, \gamma)) \end{aligned}$$

The estimated parameter values are determined with the help of the Equation (1) stated above. In the Equation (2) γ_1 and γ_2 represent in the tables the Logit and probit models the Limit_0 and Limit_1 of values. γ_1 represents that point, at the NSI C of the value (-1) the value (0), during the derivative of NSI E, assumes. γ_2 represents that point, at the NSI C of the value (0) the value (+1), during the derivative of NSI E, assumes.

On closer inspection of the signs (+/-) of the individual parameter estimated values the following results:

3.1. CCI-Variable (Commodity Channel Index)

With the computation of the CCI the deviation of the share prices from their statistic average values is determined. The CCI takes values between +100 and -100. The computation of the CCI is in the chapter "technical indicators" is represented. A CCI value of over +100 shows a strong purchase behavior and a value of under

-100 shows a strong sales behavior. As describes in the theoretical part, investors should buy at a high CCI value securities. Experienced investors buy at strong sales behavior and a CCI value around -100. A positive or minus sign at the CCI value changes from share to share. With the analysis of the shares listed in the table Ordered Logit and Ordered Probit of models showed up that with the shares of boron new facts Yapi, Usas, Petkim, Cimentas, Hazneder Tugla; Mardin Cimento and Kordsa at a high CCI value and with the remaining shares at a low CCI value to be bought should.

3.2. OSILATOR-Variable (Stochastic Oscillator)

The Stochastic Oscillator (SO) compares the conclusion value of a share with the observed price history within a fixed period. With rise of the prices the conclusion value of the security rises within the fixed period to its highest price level. With case of the prices the conclusion value sinks within the fixed period on its deepest price level sinks.

The Stochastic Oscillator is represented on the basis two different curves. The interpretation of the Stochastic Oscillators takes place due to a confrontation of these two curves (K%-curve and D% curve). The slowed down K%-curve is represented as a constant line. The slowed down K%-curve represents the sliding means of the K%-curve within a fixed period. The D%-curve however is dotted represented. The D%-curve represents the sliding means of the slowed down K%-curve.

The formula for the computation of the K%-curve reads:

$$K\% = \frac{SGKF - ED}{EY - ED} \times 100$$

SGKF: Close value of the last daily;

OD: Lowest value of the share within last five days;

EY: Maximum value of the share within the last five days.

If the conclusion value of the last daily lies in the proximity of the maximum value of the last five days, a rise of the prices is forecast and turned around. The sign of the parameter estimated value is positive (+) [6].

3.3. PVT-Variable (Price-Volume-Trend)

The regarded relationship of the prices to the acted quantity is similar to the equilibrium of the quantities and prices. With the price/quantity equilibrium becomes depending upon price rise or case, the price/quantity equilibrium of the one day lagged the up-to-date acted quantity added or taken off. With the regarded relationship of the prices to the acted quantity the acted quantity of the one day lagged cumulated a certain percentage of the

up-to-date acted quantity is added or taken off. The percentage is calculated as a function of the price rise or case.

If the acted quantity rises with sinking prices, the PVT value sinks. In this situation the PVT variable shows a strong purchase behavior with low prices. Sinking prices and a sinking quantity are characteristics for one PVT value any longer not falling. From the negative connection between acted quantity and rising prices can a minus sign of the parameter estimated value (−) be derived.

3.4. ROC (Price Rate of Change)

The price adjustment rate (ROC) shows the percent change of the price of the current daily in the comparison to the price of the previous daily.

The following formula shows the computation of the price adjustment rate:

$$\text{Price ROC} = \frac{(\text{current close} - \text{close for } x \text{ days})}{\text{close for } x \text{ days}} \times 100$$

If the prices reach a point, also the ROC value reaches a point. The sign of the parameter estimated value is negative (−).

3.5. VOLUME (Acted Quantity)

The acted quantity represents the quantity of the bought and sold shares. The development of the acted quantity and the prices gives important notes to future events. With sinking prices are more buyers. By the rise of the inquired quantity, the prices rise. The sign of the parameter estimated value is positive (+).

The parameter estimated values of the VOLUME of indicator for the regarded shares are very small. The reason for it lies to the extent of the acted quantity.

3.6. MACD (Moving Average Convergence Divergence)

With the help of the MACD trends can be illustrated. The MACD shows the relationship between two sliding averages, on whose basis purchase and sales decisions can be met.

With the computation of the MACD first a long-term and a short term exponentially sliding means are calculated. Subsequently, from the short term exponentially sliding means the long-term sliding means is taken off, in order to determine the MACD. If the short term exponentially sliding means is larger than the long-term exponentially sliding means, the result is positive and the MACD lies over the zero-line. This indicates a rise of the prices. If however the result is negative, the MACD is under the zero-line.

With the computation among other things the signal line is determined. This signal line results due to the values of the exponentially sliding means of the last nine days. If the MACD cuts the signal line from down up, then a purchase decision is met. If however the MACD from above cuts down the signal line, then a sales decision is met. A rising MACD value is characteristic for a rising price level. One can interpret a rising MACD value as sales signal. The sign is negative the parameter estimated value (−).

3.7. Momentum

The Momentum indicates the percent change of the prices within a fixed period. With the help of the Momentum the profit or loss, which a share obtains within a certain period, can be represented. The price adjustment rate (ROC) shows a similar event as the Momentum, the difference lies in the representational form. The datum line is with the Momentum with 100 and with the ROC with 0 and on the ordinate the percent change is represented. The Momentum is computed according to the formula stated down:

$$\text{Momentum} = \frac{\text{Close value of the last daily} - \text{Close value before } x \text{ days}}{\text{Close value before } x \text{ days}} \times 100$$

Summarized the Momentum shows the yield of a share in the comparison to the price before “x” days is obtained. If the Momentum a maximum value moves reached and then downward, sales decisions are met. The sign of the parameter estimated value is negative (−).

3.8. RSI (Relative Strength Index)

With the computation of this characteristic number becomes with the help of the “sliding means of the price movements upward” (MAU Moving AVERAGE UP) and the “sliding means of the price movements downward” (WAD Moving AVERAGE down) the development of the prices determines. The relative Strength index (RSI) curve takes a value between “0” and “100”. Following the determination of the MAU and WAD with the help of a formula of the RSI index is determined. A rising RSI value means a sinking price history in reverse and. The sign of the parameter estimated value is negative (−) [6].

3.9. VOLOSIL (Volume Oscillator)

The volume Oscillator (VOLOSIL) is similar to the Stochastic Oscillator. It becomes instead of for the price, for which acted quantity computes. The VOLOSIL shows the difference between the means sliding at short notice and the means of a security quantity sliding on a long-

term basis. Influence parameters on the VOLOSIL represent the method of the computation of the sliding means, the Fristigkeit and the presentation method. The sign of the parameter estimated value is positive (+).

3.10. WILLIAMS (Williams' % R)

Williams % R represents a Momentum indicator, by which levels are represented with multi-purchases and increased sale. Williams % R is interpreted similarly as the Stochastic Oscillator. In contrast to the Stochastic Oscillator has Williams % R a turned sign. If Williams lies % R between 80% and 100%, then surplus sales find with the regarded security, at a value between 0% and 20% take place surplus purchases. The purchase and sales decision should be met only if the security price moves in the reverse direction. The MACD helps with the announcement of Share-pries change. A rising Williams % R marks rising prices. The sign of the parameter estimated value is positive (+) [7].

3.11. NSI (-1)

"NSI (-1)" represents the material share price adjustment of the one day lagged. If it takes the value -1, it means that the value sank and the prices of the current daily can rise. If the "NSI (-1)" value of the one day lagged 0 or +1, then it knows a sinking of the prices meant. The sign of the parameter estimated value is negative (-).

In the Ordered Logit and Ordered Probit models became instead of the certainty measure of R^2 of the LR index (pseudo R^2) and instead of the f-Statistic the LR Statistic used. Details in addition are in the theoretical part of this work. The pseudo R^2 took very low values. This is due to the calculation method of the pseudo R^2 . A comparison with classical R^2 -values would not be correct [8].

In the classical involution model the R^2 -value between 0 and 1 can move, whereby a value means close 1 a strong correlation. Dummy Dependent variable model does not supply value close 1. On the assumption that in a given interval the correct probabilities of an event are evenly distributed, it is to be set it possible for R^2 an upper border of. For this reason a low R^2 is not unusual with the estimation of a linear probability model [9].

4. Emprical Results

Following the four ISE (Istanbul Stock Exchange) indices are aforementioned the main sector indices (industry, service, financial and technology sector) and the pertinent sub sectors.

The main sector and sub sector indices cover securities, which are not acted at the stock exchange to note and at the national market.

<u>CODE</u>	<u>INDICES</u>
XU100	ISE NATIONAL-100
XU050	ISE NATIONAL-50
XU030	ISE NATIONAL-30
XKURY	ISE CORPORATE GOVERNMENT
XUTUM	ISE NATIONAL-ALL SHARES
XUSIN	ISE NATIONAL-INDUSTRIALS
XGIDA	FOOD, BEVERAGE
XTEKS	TEXTILE, LEATHER
XKAGT	WOOD, PAPER, PRINTING
XKMYA	CHEMICAL, PETROLEUM, PLASTIC
XTAST	NON-METAL MINERAL PRODUCTS
XMANA	BASIC METAL
XMESY	METAL PRODUCTS, MACHINERY
XUHIZ	ISE NATIONAL-SERVICES
XELKT	ELECTRICITY
XULAS	TRANSPORTATION
XTRZM	TOURISM
XTCRT	WHOLESALE AND RETAIL TRADE
XILTM	TELECOMMUNICATIONS
XSPOR	SPORTS
XUMAL	ISE NATIONAL - FINANCIALS
XBANK	BANKS
XSGRT	INSURANCE
XFINK	LEASING, FACTORING
XHOLD	HOLDING AND INVESTMENT
XGMYO	REAL ESTATE INVEST.TRUSTS
XUTEK	ISE NATIONAL TECHNOLOGY
XBLSM	INFORMATION TECHNOLOGY
XSVNM	DEFENSE
XYORT	ISE INVESTMENT TRUSTS
XIKIU	ISE SECOND NATIONAL
XYEKO	ISE NEW ECONOMY

Following tables contain some of the significant parameters of variables in ordered probit models (Tables 3 and 4) [10].

4.1. Stability of the Parameter Estimated Values

The stability of the estimated parameter values, in order

Table 3. Some of the ordered probit outputs.

SAMPLE REGRESSION OUTPUTS	ABANA ELEKTRO			AK ENERJİ			AKTAŞ ELEKTRİK			AYEN ENERJİ		
	Std.Dev	Prob.		Std.Dev	Prob.		Std. Dev	Prob.		Std. Dev	Prob.	
N	2116			88			1585			90		
CCI (−1)												
OSILATOR (−1)	0.01	0.00	0.00	0.04	0.02	0.01						
PVT (−1)												
ROC (−1)	−9.34	0.48	0.00	−10.23	2.47	0.00	−4.29	0.42	0.00	−21.53	4.50	0.00
VOLUME (−1)	0.00	0.00	0.04				0.00	0.00	0.00			
MACD (−1)				0.00	0.00	0.00						
MOMENTUM (−1)							−0.27	0.15	0.08			
RSI (−1)										0.54	0.25	0.03
VOLOSIL (−1)												
WILLIAMS (−1)	0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.01
ISARET (−1)	−0.07	0.03	0.04	−0.30	0.17	0.08	−0.07	0.04	0.06	−0.48	0.20	0.02
LIMIT_0	−0.38	0.04	0.00	−0.29	0.17	0.09	−0.73	0.18	0.00	80.38	36.72	0.03
LIMIT_1	0.01	0.04	0.74	0.29	0.17	0.09	−0.33	0.18	0.06	81.04	36.74	0.03
LR index (Pseudo-R2)	0.27			0.24			0.20			0.47		
LR statistic	1134.48			42.00			648.45			79.33		
Probability (LR stat)	0.00			0.00			0.00			0.00		
HAUPT SEKTOR	XUHIZ			XUHIZ			XUHIZ			XUHIZ		
UNTER SEKTOR	XELKT			XELKT			XELKT			XELKT		

Table 4. Summary of models.

	Number of Efficient Estimations	% of Total
CCI (−1)	33	13.2
OSILATOR (−1)	108	43.2
PVT (−1)	58	23.2
ROC (−1)	250	100
VOLUME (−1)	214	85.6
MACD (−1)	75	30
MOMENTUM (−1)	27	10.8
RSI (−1)	16	6.4
VOLOSIL (−1)	49	19.6
WILLIAMS (−1)	247	98.8
ISARET (−1)	247	98.8
N (Mean)		1642
LR index (Pseudo-R2) (Average)		0.24

to be able to make prognoses over the share price change, tested in the context of this work. For this from 250 shares altogether 32 shares were selected. To the criteria for choice the number of collections and the affiliation to at least a sub sector belonged. Shares with the highest collections from each sub sector each are selected. The accomplished stability test results are in the following:

With the examination of the stability of the parameter values of the selected shares at the beginning of a third of the oldest collections of the parameter computation one takes out. In a second passage finally only more half of the collections was located—which recent collections—for the order, with which a further parameter computation is accomplished. After Chow a third of the collections and afterwards half of the collections are taken out last of the center of the entire elevations. Those only with the oldest and recent collections the parameter values are computed. The estimated parameter values with the full collection number are compared after that far method with the estimated parameter values, represented down, with smaller collections and their stability is tested.

$$H_0 = \hat{\beta} = \beta_0$$

$$H_1 = \hat{\beta} \neq \beta_0$$

A t-test was accomplished: $t_{\text{stat}} = \frac{\hat{\beta} - \beta_0}{S_{\hat{\beta}}}$

By the fulfillment of the condition $t_{\text{stat}} < t_{\text{table}}$ the H_0 hypothesis is not rejected and the stability of the estimated parameter values of the regarded 32 shares was confirmed.

The estimated parameter values and stability test determined for the selected 32 shares are in the appendix. The results displays that the change of the number of collections do not cause statistic change of the estimated parameter values.

5. Conclusions

In summary, we can say that during the derivative of NSI E: NSI C takes the value (-1) assumes that it is smaller as it is; NSI C takes the value (0) if it lies between; NSI C takes the value (+1) if it is larger as it is.

For all technical indicators with the computation of the variables one day lagged, values are used. The conclusion values of 250 shares are raised for the calculations of the technical indicators. The technical indicators as the argument were used for the determination of the parameter values, and thereby altogether 250 models are set up. It participated interesting that the estimated parameter values of the 250 shares were close. The CCI variable for 33 models, the OSILATOR variable for 108 models, the PVT variable for 58 models, the ROC variable for all models, the volume variable for 214 models, the MACD variable for 75 models, the moment around variable for 27 models, the RSI variable for 16 models, the volume OS IL variable for 49 models, the WILLIAMS variable for 247 models and the NSI (-1) variable for 247 models are efficient.

With those models, in which the technical indicators represent the arguments, Turkcell, Anadolu Efes and Ayen Enerji had extreme parameter values. Since the number of collections is very small with these shares, one can meet the acceptance that iterated parameter values are not reached.

5.1. Model Prognoses

With above the 32 shares select for the stability test of the estimated parameter values, prognoses become for one period of three months (10 October to 24 January 2007) accomplished. With these prognoses, the "NSI R" (NSI calculated) of values is determined and derived from these the "NSI E" (NSI estimated). The derived "NSI E" of values is compared afterwards with the "NSI R" (NSI real) values.

Point prognoses and interval prognoses are accomplished. In the context of the point prognosis, the values of "NSI C" were determined with the Limit_0 and Limit_1 being compared and "NSI E" derives from it. "NSI C" was under Limit_0 to "NSI P" on (-1) and was then specified. With the "NSI C" between Limit_0 and Limit_1, "NSI E" is specified on (0) with a "NSI C" over Limit_1 on (+1). After derivative of "NSI E", it is compared with "NSI R" and prognosis accuracy is determined. In the case of the point, prognoses resulted is prognosis accuracy between 54 to 72 percent.

For the execution of the interval prognoses, additionally the "NSI still becomes CU" value (NSI calculated lower one limit) and "the NSI CO" value (NSI calculated upper one border) is determined. With the help of these two limit values, during the derivative of the "NSI E", the "NSI of EU" values (NSI prognosticated lower ones limit) and "NSI of EO" values (NSI prognosticated upper one border) are derived. It was checked whether the "NSI R"-value is within these two values (between "NSI EU" and "NSI PO"). With the regarded 32 models (ever a model per share), "NSI R" is observed within these interval values with a frequency from 70 to 96 percent.

The intervals ("NSI EU" and "NSI EO") failed sometimes very closely and again very broadly. With very close intervals (ex.: "NSI EU" = +1 and "NSI EO" = +1). "NSI E" can speak with the interval borders of safe prognoses with the agreement of the point prognosis. On the other side the interval borders far apart ("NSI EU" = -1 and "NSI EO" = +1) cannot be made safe statements about the point prognosis "NSI E". The reason for the far interval borders lies in the high standard deviation and the Limit_0 and Limit_1 values, for which again as influence of external factors is lying far apart, speculation behavior is responsible.

With the regarded 32 shares, one could observe the interval width of "NSI EU" within the observed period of 3 months = -1 to "NSI EO" = +1 between 9 percent and 83 percent, an average value of 57.4 percent for 32 shares results. "NSI EU" = +1 to "NSI EO" = +1 was observed with the 32 shares within the period by 3 months with a frequency from 5.5 to 62.5 percent, and resulted in an average value of 20.1 percent. When agreeing the "NSI E", "NSI EU" and "NSI EO" value an agreement with "NSI R" which is determined between 61 and 100 percent, *i.e.* with an average value of 89 percent.

In principle, one can say that with all securities with 18 (= 0.201 * 0.89) percent of probability safe prognoses can be accomplished. In summary, we can say that one with 63 percent of correct point prognoses altogether with approx. 57 percent of all prognoses about no safe prognoses to talk can lie apart, and there the interval borders far and with approx. 18 percent about safe prognoses to talk can lie apart. 25 percent of the remaining can be

Table 5. Point and interval prognoses.

Stock		NSI E Correct	Interval Estimation Correct	NSI E = NSI EU = NSI EO	NSI E = NSI EU = NSI EO Correct	NSI PU = -1 NSI PO = +1 NSI P Betwixt
İŞ BANKASI (C)	Amount	43	67	13	11	43
	in %	60.56	94.37	18.31	84.62	60.56
YAPI VE KREDİ BANK.	Amount	46	67	17	15	35
	in %	64.79	94.37	23.94	88.24	49.30
İKTİSAT FİN. KİR.	Amount	42	66	16	14	37
	in %	59.15	92.96	22.54	87.50	52.11
VAKIF GMYO	Amount	39	64	8	6	48
	in %	57.35	94.12	11.76	75.00	70.59
ALARKO HOLDİNG	Amount	43	66	18	16	37
	in %	60.56	92.96	25.35	88.89	52.11
ENKA HOLDİNG	Amount	56	76	12	11	53
	in %	72.73	98.70	15.58	91.67	68.83
KOÇ HOLDİNG	Amount	41	69	17	14	38
	in %	56.94	95.83	23.61	82.35	52.78
ANADOLU SİGORTA	Amount	39	51	45	37	7
	in %	54.17	70.83	62.50	82.22	9.72
ANADOLU GIDA	Amount	45	67	13	8	39
	in %	65.22	97.10	18.84	61.54	56.52
MARET	Amount	47	71	17	16	34
	in %	65.28	98.61	23.61	94.12	47.22
PINAR SU	Amount	50	71	5	4	60
	in %	69.44	98.61	6.94	80.00	83.33
AYGAZ	Amount	45	70	11	10	38
	in %	62.50	97.22	15.28	90.91	52.78
BRİSA	Amount	44	66	22	18	36
	in %	62.86	94.29	31.43	81.82	51.43
ECZACIBAŞI İLAÇ	Amount	49	71	15	15	56
	in %	69.01	100.00	21.13	100.00	78.87
PETKİM	Amount	44	70	14	14	43
	in %	61.11	97.22	19.44	100.00	59.72
ÇELİK HALAT	Amount	46	72	8	8	49
	in %	63.89	100.00	11.11	100.00	68.06
EREĞLİ DEMİR ÇELİK	Amount	52	70	13	12	42
	in %	72.22	97.22	18.06	92.31	58.33
SARKUYSAN	Amount	51	68	12	12	37
	in %	70.83	94.44	16.67	100.00	51.39

Continued

ARÇELİK	Amount	45	68	19	16	42
	in %	62.50	94.44	26.39	84.21	58.33
MAKİNA TAKIM	Amount	39	66	15	11	44
	in %	54.17	91.67	20.83	73.33	61.11
T.DEMİR DÖKÜM	Amount	47	71	8	7	47
	in %	65.28	98.61	11.11	87.50	65.28
ÇİMSA	Amount	44	71	14	13	43
	in %	61.11	98.61	19.44	92.86	59.72
İZOCAM	Amount	43	71	9	8	41
	in %	59.72	98.61	12.50	88.89	56.94
TRAKYA CAM	Amount	40	68	18	16	33
	in %	55.56	94.44	25.00	88.89	45.83
AKAL TEKSTİL	Amount	44	70	13	12	40
	in %	61.11	97.22	18.06	92.31	55.56
KORDSA SABANCI DUPONT	Amount	54	69	18	17	37
	in %	75.00	95.83	25.00	94.44	51.39
YÜNSA	Amount	42	70	9	8	40
	in %	58.33	97.22	12.50	88.89	55.56
GENTAŞ	Amount	51	72	15	15	43
	in %	70.83	100.00	20.83	100.00	59.72
KARTONSAN	Amount	40	70	4	3	53
	in %	55.56	97.22	5.56	75.00	73.61
HÜRRİYET GZT.	Amount	47	72	8	8	49
	in %	65.28	100.00	11.11	100.00	68.06
ALCATEL TELETAS	Amount	50	70	21	19	39
	in %	69.44	97.22	29.17	90.48	54.17
ASELSAN	Amount	46	71	15	15	42
	in %	63.89	98.61	20.83	100.00	58.33

stated about the point prognoses as well as the intervals made (**Table 5**).

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Tax Shield and Its Impact on Corporate Dividend Policy: Evidence from Pakistani Stock Market

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ABSTRACT

The problem: what is the taxation impact on dividend policy? While much optimal taxation research focuses on the economic effects of taxation, the purpose of this study is to add a new dimension by investigating the relationship between taxation and payout ratio and some other variables of dividend policy. These relations are tested using the data from financial statements of KSE listed companies. The results show that tax shield has no significant relation to the dividend payout ratio but mostly dividend policy is due to the size of the firm and its profitability.

Keywords: Dividend Policy; Tax Shield; Determinant's of Dividends

1. Introduction

A snowy debate in finance and public economics literatures about the role of taxation in corporate dividend policies is there. Taxes and dividend policy are the one of the very important topics of corporate finance, as well as for the Pakistani stock market. A lot of arguments regarding taxes and dividend policy have attracted many educational researchers. Dividends, since the days of Miller and Modigliani, have been a topic of extensive research in academia and the debate between practitioners. Dividends provide “recompense” in a sense to investors who have taken a menace by investing in the stock of a certain company. Income that is earned by the company is distributed to shareholders, and repeatedly increases over time. They are normally paid on a regular basis, such as quarterly. Companies that have a record of paying dividends are usually traded at a first-class versus those that do not. Investors in the company are thus provided cash flow without having to sell shares; therefore, traditionally, companies paying relatively high dividends have been purchased by those on a fixed income. Manager's base current dividend levels of past dividend levels and current earnings and imagine dividends are steady over time [1]. On the other side, some theories have conservative opinion that dividend policy is applicable due to the existence of differential taxes in the market [2] (Poterba and Summers, 1984; Ang *et al.*, [3,4]). Others disagree that

“Clientele Effects” matter in dividend policy decisions (Pettit, 1977; Scholz, 1992). It is because investors' preferences divide them in groups that tend them to select a company where their investment goals and dividend policy are associated. Signaling models focus on allaying the information asymmetries. The former known as “Signaling” theory, assumes that the dividend is one of the sources through which a company can suggest information to the market (Bhattacharya, 1979; [5,6]). According to this theory, the dividend can moderate information asymmetries between managers and shareholders by conveying inside information of a firm's future prospects. The latter, known as “Agency” theory, argues that the dividend reduces the costs of shareholder-manager conflict and it performs a controlling function where monitoring of a firm's management by its Shareholders is inactive [7]; Easterbrook, in 1984, [8] argues that by paying dividends the flexible resources under managerial control can be decreased and in this way the over investment difficulty can be determined. Actual company earnings are another key determinant of dividend payouts. There is a statistically significant relationship between dividends and earnings [9,10] (Hsu, Wang, & Wu, 1998; Lintner, 1956). Bhattacharya (1979), Miller and Rock (1985) [11] show that adjustments in dividend payments are connected to changes in earnings. A relationship between dividends and earnings is also reported in other studies

[12,13] (Watts, 1973, Gonedes, 1978, Lee & Kau, 1987). Analyzing time series and cross-sectional data, Fama shows that dividends and earnings are extremely correlated. However, a survey with 384 financial executives conducted by Brava, *et al.* (2005) shows that the connection between earnings and dividends has weakened the market debt to capital ratio which is another possible explanation of the variability in dividend payments. Several papers have found a negative relationship between leverage and dividend payout ratios. This negative relationship is plausible due to the extent that debts and dividends are substitutes employed by managers to mitigate agency conflicts or asymmetric information problems, and this implies that an increased market debt to capital ratio reduces dividend payout rates and vice versa. The objective of this study is to assess the effect of tax shield on the dividend policies in the KSE listed companies of Pakistan. This study will also evaluate the role of taxes to establish the dividend policies of the corporate sectors. This study has the capacity to be helpful to policy makers to better recognize how taxes impact dividend policies and they will be in a better position to develop dividend policies by keeping in view of the influence of taxes. Before conducting this study, our expectation was that tax saving would directly go to the shareholders of the company.

2. Literature Review

[14] suggested in their study that before- and after-tax returns to capital cannot be precisely estranged from the tax system. They emphasized that in the best dividend payout behavior, one cannot be separated away from equilibrium concern and the analysis of the effect of taxation on business valuation. [15] proposed that due to the impediment in personal tax advantage of dividend, the shareholder greatly prefers to invest in real assets to use internal financing as compared to external. The profitability of internally financed security investment is dependent on the tax status of security and also the tax bracket of shareholder. In contrast, externally-financed security purchases are making loss from a tax stand point. [16] evaluated the tax effect on dividend policy of Nigerian banks and proposed in their study that various factors influenced the dividend pattern of companies. Due to the accessibility of the profit, the dividend policy of the banks is to frequently sustain a low but constant payout. The most important factor of the dividend structure is the liquidity position of the company. Dividend clients are a very alarming aspect in the concern of a dividend policy. [17] identified the signaling equilibrium with taxable dividends in their theory. They described in their theory that the employees of the organization, with more essential and confidential information, best allocate larger dividends and obtain higher prices for their stock whenever firms have a demand of cash; thus, its existing

stockholders exceed its internal supply of cash. Green *et al.* (1993) questioned the irrelevance argument and investigated the relationship between the dividends and investment and financing decisions. Their study showed that dividend payout levels are not totally decided after a firm's investment and financing decisions have been made. Dividend decision is taken along with investment and financing decisions. The results however do not support the views of Miller and Modigliani (1961) [18]. Partington (1983) revealed that firms' use target payout ratios, firms' motives for paying dividends and extent to which dividends are determined are independent of investment policy. [19] indicates a direct link between growth and financing needs: rapidly growing firms have external financing needs because working capital needs normally exceed the incremental cash flows from new sales. Higgins (1972) shows that payout ratios are negatively related to firms' need top fund finance growth opportunities. Rozeff (1982), Lloyd *et al.* (1985) and Collins *et al.* (1996) all show significantly negative relationship between historical sales growth and dividend payout. D, Souza (1999) however shows a positive but insignificant relationship in the case of growth and negative but insignificant relationship in case of market to book value. In the seminal work on dividends and company's maturity, Grullon *et al.* (2002) analyzed listed companies of New York (NYSE) and American (AMEX) stock exchanges between 1967 and 1993. They argued that company that increases dividends experience a significant decline in their systematic risk and such companies do not increase their capital expenditure and experience a decline in profitability in the years after the change in dividends. They proposed an alternative explanation of Jensens's (1986) free cash flow hypothesis known as "Maturity Hypothesis". According to them in growing stage a company has many positive NPV projects and it earns large economic profits with high level of capital expenditure. Such companies are left with low free cash flows and experience rapid growth in their earnings. But as a company continues to grow due to market competition, its share price is cannibalized which reduces its profits. In this transition phase, the company's investment opportunities begins to shrink and pace of its growth becomes slow, hence company starts generating larger amount of free cash flows. Ultimately it enters into maturity phase in which the return on investment is close to the cost of capital and its cash free cash flows are high. These mature companies are now able to pay higher dividends. Ahmed and Javid [20] proposed in their study that whenever the non-financial companies of Pakistan quoted on Karachi Stock Exchange set their dividend payments, these firms consider the existing earning per share and past dividend patterns. But, the tendency of dividend should be more responsive to current earnings than previous dividends. The listed non-financial companies having high momen-

tum of modification and low target payout ratio, show instability in smoothing their dividend payments. It is evident from existing literature that very few researchers have analyzed the relationship of tax shield and dividend policy. Although, many researchers have used taxation and dividend policy, but to the best of authors' knowledge, none of the researchers have analyzed the nature of the relationship between tax shield and dividend policy in Pakistan. The main objective of present study is to analyze, using a non-linear model specification, whether mature companies pay more dividends or not?

3. Objective & Expectation

The objective of this study was to find out the relationship between the tax shield and dividend payout ratio and expectation was that tax shield would impact the positively on dividend payout policy.

4. Data Collection & Methodology

For present study a sample penal data of 33 companies listed at Karachi Stock Exchange (KSE) has been collected for the period of six years *i.e.* from 2005-2010. Companies were listed at KSE during years 2005 to 2010. Should not be a State Owned Enterprise. Panel regression is among the widely used technique to investigate the impact of firm specific characteristics on dividend We have used the same estimation technique to analyze the impact of ownership structures and cash flow characters on dividend behavior of companies listed in KSE Pakistan.

Payout ratio is used as a proxy of dividend policy, which was calculated by dividend per share with EPS. Debt to equity ratio is used as a proxy of leverage. Moreover, tax shield was calculated by multiplying the tax rate with interest amount. Return on asset is used as a proxy of profitability. Size was calculated by taking the log of total assets.

5. Results and Discussion

Table 1 shows the mean, standard deviation, skewness etc. For measuring the deviation of the variables from each other's as its objective is to investigate the relationship between tax shield and dividend policy. **Table 2** shows that p-value of F-statistic are less than 0.05. Moreover, F-statistic value is non-zero. Both these values prove the model fitness. R square value shows that 7.23% variation in dependent variable is explained by independent variables. In addition to this, results shows that there is insignificant value between leverage and dividend policy as its p-value is greater than 0.05.

Results also showed that there is significant positive relationship between profitability and dividend policy. Its beta co-efficient value is 0.000908 and there is insignificant relation between the leverage and the dividend policy as its co-efficient is -0.000450 and also insignificant relationship between tax shield and dividend policy as its co-efficient is -0.005327 and insignificant relationship between the size of the firm and dividend policy as its co-efficient is 0.007738.

Table 1. Descriptive statistics.

	PAY	LEV	PROF	SIZE	TS
Mean	0.027734	1.014639	10.14954	14.38144	8.879438
Median	0.015676	1.075000	10.07500	15.00000	8.797155
Maximum	0.593824	9.710000	53.51000	17.00000	12.75032
Minimum	-0.714286	-14.75000	-46.73000	11.00000	2.734368
Std. Dev.	0.084186	2.447218	16.72553	1.529965	1.981065
Skewness	-0.992175	-2.178721	-0.260952	-0.196899	-0.270824
Kurtosis	46.19498	15.63794	3.648231	2.224797	2.680634
Jarque-Beta	15113.76	1444.531	5.598424	6.111124	3.195959
Probability	0.000000	0.000000	0.060858	0.047096	0.202305
Sum	5.380321	196.8400	1969.010	2790.000	1722.611
Sum Sq. Dev.	1.367854	1155.853	53990.45	451.7732	757.4514
Observations	194	194	194	194	194

Table 2. Regression analysis.

Dependent variable: PAY				
Method: panel least squares				
Sample: 2005 2010				
Periods included: 6				
Cross-sections included: 33				
Total panel (unbalanced) observations: 194				
Variable	Coefficient	Std. error	t-statistic	Prob.
Intercept	-0.045003	0.059240	-0.759678	0.4484
LEV	-0.000450	0.002435	-0.184959	0.8535
TS	-0.005327	0.004029	-1.322216	0.1877
PROF	0.000908	0.000418	2.168689	0.0314
SIZE	0.007738	0.005387	1.436339	0.1526
R-squared	0.072338	Mean dependent var		0.027734
Adjusted R-squared	0.052705	S.D. dependent var		0.084186
S.E. of regression	0.081938	Akaike info criterion		-2.140280
Sum squared resid	1.268906	Schwarz criterion		-2.056057
Log likelihood	212.6071	Hannan-Quinn criter.		-2.106175
F-statistic	3.684498	Durbin-Watson stat		1.712100
Prob (F-statistic)	0.006493			

6. Conclusion

The conclusion is that the firm size and profitability are positively related to the dividend payout policy. Whereas, our study showed the insignificant relationship between the tax shield and leverage on the dividend payout policy. Positive results mean that, if the company size and profitability increase, the company will pay more dividends whereas the tax shield and leverage will not affect the dividend policy. Our study supports some studies and also does not support some research findings. We support Talat Afza and Hamad Hassan Mirza's findings in 2010 and do not support the Kanwal Anil Study in 2008.

7. Limitations

This study is limited to the KSE and may not apply the other countries and this sample shows these results other study may find the different results more sample size may shoe the difference result.

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