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EFFECT OF JUSTICE IN COMPLAINT HANDLING ON CUSTOMER LOYALTY: EVIDENCE FROM EGYPT

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ABSTRACT

The main objective of this research is to identify and validate the factors that significantly influence customer loyalty during the complaint handling process in Egypt. The literature alludes to the effect of perceived justice of the complaint handling process on customer satisfaction and loyalty after the complaint. These relationships are tested and validated in the Egyptian context over ten different industries. The outcome of this research gives further validation to the finding of previous empirical studies in a novel context. The results will benefit Egyptian companies in different sectors to better handle customer complaints, as they will recognize the major variables that they should address.

JEL: M310

KEYWORDS: Justice, Customer Loyalty, Complaint Handling, Customer Satisfaction, Egypt

INTRODUCTION

Even when companies put forth their best efforts to serve their customers, customer complaints are inevitable and are a regular part of doing business (Fierro et al. 2015). Complaint handling systems are the ultimate test for a company’s customer orientation as they strive to create satisfactory resolutions to customer concerns. A company may risk losing previously loyal customers when grievances are poorly handled. This implies that existing levels of customer satisfaction do not offer foolproof protection against the consequences of ineffective complaint handling. Looking at the issue from the other side of the coin, satisfactory handling of customer complaints may likely enhance customer loyalty. Studies have shown high returns on investment in effective complaint handling systems (TARP 1986; Fornell et al. 2006; Fierro et al. 2015). Thus many companies are seeking to develop such systems to cultivate loyalty among their customers. In doing so, two distinct approaches have been cited, the first of which involves setting standard procedures to program complaint handling employees on how to deal with customers in specific situations. The second approach takes a more open stance and consists of training and motivating employees to adopt a set of shared values that would likely lead to the desired behaviors.

The current study explores how Egyptian customers in ten different industries perceive the quality and fairness of the complaint handling process, and how complaint-handling perceptions affect customer loyalty. The following section reviews the literature on justice and complaint handling and the impact on customer loyalty and satisfaction. The literature review is used to develop the conceptual model. Next, the methodology section describes the data collection phases and the analytical methods used. The results of the measurement and conceptual model testing are given next, followed by the main conclusions of the study. Limitations of the current study and avenues for future research are finally presented.
LITERATURE REVIEW

Complaint Handling and Complaint Satisfaction

Customer complaints include all written, oral or electronic communications in which customers express their displeasure regarding some deficiency or failure in the product or service. Complaint handling involves strategies whereby companies attempt to resolve the failure and learn from it to avoid future failures, while regaining the customers’ perception of the company’s reliability (Shammout and Haddad, 2014). While the ultimate guidance in service marketing is to perform the service right the first time, mistakes are sometimes unavoidable (Fierro et. al., 2015). The literature documents the pervasiveness of customer complaints in instances of service failure (Gelbrich and Roschk 2011; Zu et. al. 2013). Communication in the context of complaint handling offers companies an opportunity to turn angry customers into loyal ones (Rothenberger et. al. 2008). Moreover, it provides an opportunity for the company to learn about its deficiencies and to retain its customers while influencing their perceptions and behavior as well as the future satisfaction of all the company’s customers (Lovelock and Wright 2002; Gelbrich and Roschk 2011). This is why it is of utmost importance to handle every complaint with care and to take customer communications seriously (Bodey and Grace 2006). It also explains why customer communication should be encouraged and complaints should be perceived as opportunities for quality improvement, enhancement of customer satisfaction and positive word of mouth (Blodgett et. al. 1997). Effective complaint handling helps companies avoid losing dissatisfied customers to competitors and the spread of negative word of mouth (Stauss 1990; Gelbrich and Roschk 2011).

Customers who experience a service failure may display one of four possible responses, the simplest of which is to do nothing. However, some of the customers who decide to do nothing will tell a friend about the bad experience, in which case there is a risk of negative word of mouth. The second possible response is to file a complaint and if the problem is not resolved, the customer may choose to escalate the complaint to a higher level either inside or outside the company, to consumer advocacy groups, regulatory agencies, civil or criminal courts. Finally, the customer may choose to switch suppliers and discourage others using the service firm through negative word of mouth (Gelbrich and Roschk 2011). A study on customer switching in service industries reports that 10% of all respondents who switched suppliers did so due to unsatisfactory response to a prior service failure, 25% due to a failure in the core service and 19% due to unsatisfactory encounter with an employee (Keveaney 1995; Wang et al. 2011).

Therefore, when a customer is dissatisfied, the company runs a risk of losing all future revenue streams that could be generated through repeat business by the customer. In addition, the company also risks losing possible revenue streams of the customers’ friends and relatives, who may decide not to do business with the company based on negative word of mouth. The TARP’s “Complaint Handling in America” reports show the returns on investment in customer complaint handling programs through relating the associated costs with the value of retaining profitable customers (TARP, 1986; Fierro et. al. 2015). In a sense, these results invite companies to reframe their views on customer complaint programs and to consider them as profit - not cost - centers (Lovelock and Wright 2002; Stauss and Schoeler 2004; Fierro et. al., 2015). The above review points to the salience of maintain customer satisfaction after the complaint has been handled in addition to achieving customer satisfaction with the complaint handling process. Complaint Thus, complaint satisfaction is a key construct in the model we develop. Complaint satisfaction indicates the degree to which the complainant perceives the company’s complaint-handling performance as meeting or exceeding his or her expectations. (Gilly and Gelb, 1982; McCollough et al, 2000)

Procedural, Interactional and Distributive Justice in Complaint Handling

The literature provides evidence that customers’ perceptions of fairness in the complaint handling process are key drivers of customer satisfaction and loyalty after the complaint (Homburg et. al. 2010). The idea
of perceived fairness is rooted in justice theory (Gilliland et. al. 1993; Greenberg & McCarty 1990). Customer perceptions of fairness are driven by two kinds of drivers, namely drivers relating to the customer characteristics, which the company cannot change, and drivers relating to the design of the complaint handling system, which the company has control over (Homburg et. al. 2010). The literature points to three determinants of customers’ perceived fairness, which stem from the quality of the complaint handling process, and these are procedural justice, interactional justice and distributive justice (Smith et al., 1999; Karatepe, 2006; Siu et. al. 2013; Min et. al. 2014)). Each of these constructs is explained in detail and developed next. The literature on complaint handling emphasizes the impact of perceived fairness of the complaint handling process on customer satisfaction and loyalty after the complaint (McCollough et. al., 2000; Karatepe, 2006; Siu 2013). The construct of procedural justice reflects the extent to which customers perceive the process to be timely, to allow the customer control, to provide the customer with an opportunity to express feelings about the problem and to present information relevant to firm’s decision about the results of the complaint (Goodwin, 1992; Tax et al., 1998, Min et.al. 2014). It is also defined as the perceived fairness of the means by which the ends are accomplished (Lind and Tyler, 1988). Procedural justice is important as it aims to resolve conflicts in ways that encourage the continuation of a productive relationship between the disputants even when outcome is not satisfactory to one or both parties (Floger, 1987; Greenberg, 1990; Siu et.al. 2013). Therefore, we hypothesize that procedural justice has a positive impact on the customer’s satisfaction with the complaint handling experience.

**H1: Perceived procedural justice has a direct and positive effect on complaint satisfaction.**

Interactional justice relates to the perceived fairness of the employees’ behavior toward the complainant. It includes customer perceptions of employee empathy (Tax et Al., 1998; Min et.al., 2014), employee politeness (Goodwin, 1992) and employee effort (Smith et Al., 1999; Min et.al., 2014). It is also defined as the fairness of interpersonal treatment experienced by customers while the company’s employees apply the complaint handling procedures (Bies and Shapiro, 1987; Gilliland, 1993; Siu et. al., 2013). Interactional justice helps to explain why some people might feel treated unfairly although they can describe the decision making procedure and results as fair (Bies and Shapiro, 1987). Research shows that the phase of communication between the customers and employees (Clemmer, 1998; Goodwin, 1992; Min et. al., 2014) together with the efforts exerted to resolve a conflict (Mohr and Bitner, 1995) affect customer satisfaction (Gelbrich and Roschk 2011). Therefore, we postulate that there is a positive relationship between perceived interactional justice and customer satisfaction.

**H2: Perceived interactional justice has a direct and positive effect on complaint satisfaction.**

Distributive justice refers to the fairness of the complaint outcome, as the customer perceives it. The distributive justice construct embodies notions of equity in the distribution of benefits and burdens (Boatright 2013). An important consideration for the customer is equity in the distributive sense, which is achieved if the customer receives the same outcome as compared to previous complainants with the company (Tax, et al., 1998). Perceptions of equity also concern the degree to which the outcome matches the needs of the customer (Smith et Al. 1999; Harris et.al. 2013). Several studies support the idea that customer evaluations of equity affect customer satisfaction (Oliver and Swan, 1989; Gelbrich and Roschk 2011; Harris et. al. 2013). For the purpose of the current study, perceived distributive justice is indicated by the degree to which the customer perceives the compensation received as a result of the complaint process to be fair. Therefore, we hypothesize that perceptions of distributive justice in the outcomes of complaint handling will positively affect complaint satisfaction.

**H3: Perceived distributive justice has a direct and positive effect on complaint satisfaction.**
Customer Satisfaction

Customer satisfaction has been a central concept in marketing and management for decades (Drucker 1954; Levitt, 1960; Gronroos 1990; Anderson and Sullivan 1993; Anderson et. al. 1994) and has taken on an additional significance since the 1980s with the spread of the quality management movement. Customer satisfaction is an attitude adopted by the customer that indicates the extent to which brands, products and services meet the customer’s requirements and expectations (Szymanski and Henard 2001; Varela-Neira et al 2010; Flint et. al. 2011). Customer satisfaction has been explained in the literature based on the disconfirmation theory and the equity theory. The disconfirmation theory explores the gap between the customer’s expectations of the product or service quality and their actual experience with the brand, product or service (Oliver 1997). According to the equity theory, customers will be satisfied if they perceive the rewards of buying the product or service to match or exceed the money and effort spent on the product or service (Oliver and Swan 1989).

The literature suggests perceived quality and perceived value as important determinants of customer satisfaction (Fornel 1996; Hu et al, 2009; Khurana, 2014; Khan & Fasih, 2014; Gallarza et. al., 2013). Perceived quality relates to the disconfirmation theory view of customer satisfaction. Customers’ perceptions of the product or service quality have both a hard and a human aspect. The hard aspect of perceived quality relates to the product or service attributes and benefits. The soft aspect of perceived quality relates to the interpersonal experience and the service atmosphere around the core product or service. Perceived value relates to the customer’s perception of the quality they get as compared to the price they pay, or value for money (Kristensen et al., 2000). Thus, perceived value is based on the equity theory view of customer satisfaction. In the context of complaint handling, the customer’s experience and satisfaction with the complaint handling process is expected to influence the level of overall customer satisfaction with the company after the complaint handling process. As mentioned earlier in the introduction, previously high levels of customer satisfaction do not provide foolproof protection for the company if the customer complaints are inadequately handled. Therefore, one of the important objectives of complaint handling systems is to maintain and even enhance the overall satisfaction of the customer with the company. Therefore, we hypothesize that complaint satisfaction will have a direct impact on overall customer satisfaction after the complaint.

H4: Complaint satisfaction has a direct and positive effect on overall customer satisfaction after the complaint.

Customer Loyalty

With the rise of globalization and the advances in information and communication technologies, customer awareness of and exposure to competitors has grown, thereby making competition more challenging. Increasingly, companies are finding that to achieve long-term profitability they need to go beyond simple price and quality optimization, and cultivate loyalty to their brands, products or services (Helgesen 2006; Flint et. al. 2011). One of the most effective ways to manage the challenges of competition in the twenty first century is to maintain and increase the company’s base of loyal customers. Thus, customer loyalty and its antecedents have featured prominently in the marketing literature over the last few decades. Studies have shown that acquiring a new customer may cost the company up to six times as much as retaining an existing customer (Rosenberg et. al. 1984; Reichheld and Scheffter, 2000). Moreover, increasing customer loyalty is an important factor in growing a company’s market share in highly competitive industries, increasing its profitability (Jarvis and Mayo, 1986; Helgesen 2006) and attaining a sustainable competitive advantage (Kotler and Singh 1981). Oliver (1999) defines loyalty not only as repurchase of a product or service, but rather as repurchase despite the presence of situational factors that may potentially result in switching behavior. Oliver proposes four levels of loyalty, namely cognitive, affective, conative and action loyalty. Cognitive loyalty refers to the customer’s thoughts and conviction about why he/she chooses the
company’s offer over others. This cognitive loyalty is usually related to features and benefits of the product or service and the price offer, not the brand per se, and is likely to change if the customer finds a better offer. Affective loyalty refers to customers’ feelings of familiarity and liking toward the brand, product or service, which develops after repeated purchases. Conative loyalty refers to customer intentions to continue to purchase the brand, product or service while action loyalty refers to an insistence to buy the brand even if to do so, the customer needs to bear an inconvenience or exert extra effort to overcome obstacles (Oliver 1999). In the context of customer complaints, one of the major objectives of a complaint handling system is to maintain customer loyalty after a customer has experienced dissatisfaction with a company’s product or service. As mentioned earlier, when customers experience a perceived failure, the company risks losing the customer as well as members of the customer’ network through negative word of mouth. Effective handling of complaints offers an opportunity for turning angry customers into loyal ones. For purposes of the current study, loyalty is defined as the degree to which a customer has continued the relationship with a company after the complaint and the degree to which the customer intends to do so in the future (McCollough, et al., 2000). As explained above, the evidence in the literature indicates that complaint satisfaction and overall customer satisfaction will likely affect the degree of customer loyalty after the complaint.

H5: Overall customer satisfaction after the complaint has a direct and positive effect on customer loyalty after the complaint.

H6: Complaint satisfaction has a direct and positive effect on customer loyalty after the complaint.

Figure 1 The Conceptual Model of Complaint Handling

The figure illustrates the conceptual model, where Procedural Justice, Interactional Justice and Distributive Justice affect the degree of Complaint Satisfaction. Complaint Satisfaction determines the degree of overall Customer Satisfaction after the complaint as well as Customer Loyalty.

DATA AND METHODOLOGY

The data collection took place over two stages. The first exploratory stage involved collecting data of a qualitative nature through conducting a set of face-to-face expert interviews. The experts were selected through judgmental sampling and an interview discussion guide was used. The objective of the qualitative stage of data collection was to get an in-depth understanding of the complaint handling phenomenon before designing the conclusive quantitative questionnaire. Semi-structured in-depth interviews with experts explored customer complaints in general as well as specific efforts exerted by the experts’ companies in order to resolve customer complaints. Additional interviews with complaining customers were conducted to understand their feedback on how company complaint handling affected their relationship with the companies, and if they were still loyal to those companies. The output of those interviews as well as the literature review was used to develop the proposed theoretical framework.
The second phase of data collection used a closedended questionnaire to test and identify the variables affecting customer loyalty after the complaint handling process. The questionnaire relied on items developed on a five-point likert scale, graded from “Strongly Disagree” to “Strongly Agree”. The scale items measuring both the independent and dependent constructs are based on the questionnaire presented by Homburg & Fürt (2005). The researchers used a mixture of judgmental and convenience sampling to pick the survey respondents, to which the survey was administered in person through a paper-and-pencil format. The sampling criterion was selected based on the views of the experts, who reported that most of those who file complaints are between the ages of 18 and 40 years old. Accordingly, convenience sampling was used to select respondents from among the visitors, clients and members of sporting clubs, universities, cafés, hotels, multinational companies and non-governmental organizations (NGO’s) in Egypt.

The researchers chose to ask the respondents to use the self administered questionnaire face-to-face instead of distributing them through the internet as this allowed the opportunity to explain to the respondents any unclear questions and ask them for clarifications or further information. This face-to-face interaction with the survey respondents helped the researchers to further understand the reactions of the complainants toward the companies. Based on the expert interviews, the total population for complaining customers is around 500,000 customers. Based on Sekaran (2003) and Krejcie and Morgan (1970), the minimum sample size for populations over 100,000, is 384. Therefore, our target sample size was to get 420 responses and we succeeded in collecting 330 responses. Out of 330 total responses, 61 persons answered the full survey questions on 3 different complaint incidents (totaling 183 responses), 26 persons answered 2 complaints (totaling 52 responses) and 95 persons answered 1 complaint. The total number of persons who were asked to answer the questionnaire was 202 out of which 3 persons refused to answer, and 17 persons had never filed a complaint before, giving a response rate of 90%.

RESULTS AND DISCUSSION

The data analysis followed Anderson and Gerbing’s (1988) two step approach in which the analysis task is divided into two steps; the first step is a confirmatory measurement or factor analysis specifying the relations of the observed measures to their posited underlying construct and the second step is a confirmatory structural model that specifies the causal relations of the constructs to one another as posited by theory. In this regard, LISREL 8.72 was selected as the software tool used in the analyses.

Analysis of the Measurement Model of Complaint Handling

The evaluation of the measurement model consisted of confirmatory factor analysis to assess four classes of tests: unidimensionality tests, convergent validity, reliability, and discriminant validity (Anderson & Gerbing, 1988; Steenkamp & Van Trijp, 1991). Confirmatory factor analyses were further used for measures purification whereby items involved in high residuals were removed. This further improved the model fit and construct validity and reliability. The overall model fit statistics for complaint handling are within the generally accepted thresholds and suggest an acceptable goodness-of-fit (X2= 153.10, DF = 89; X2/df =1.72; RMSEA=0.045; NNFI=0.99; CFI=0.99; GFI=0.95; AGFI=0.92; SRMR =0.027) and all loadings were substantial and highly significant. Moreover, construct reliability values exceeded the recommended threshold of 0.60 (Bagozzi & Yi, 1988). Accordingly with all the analysis performed on the measurement model, unidimensionality might be suggested. Because unidimensionality is a necessary but not sufficient condition for construct validity (Anderson & Gerbing, 1988), the following paragraph addresses the issues of reliability, convergent validity and discriminant validity.

Reliability of the measurement model was judged by computing the composite reliability for each of the constructs. As seen from Table 1 below, composite reliability is above Bagozzi and Yi’s (1988) 0.6 suggested threshold. Hence, reliability for the constructs present in the measurement model was judged to be adequate. Reliability is a necessary but not a sufficient condition for validity as a set of items can be
reliable without exhibiting convergent validity (Steenkamp & Van Trijp, 1991). Therefore, the following
discussion tackles the convergent validity of the constructs. First, correlations between the items and the
construct exceeded 0.5, supporting convergent validity (Hildebrandt, 1987). Also, Table 2 shows that all
the average variances extracted (AVEs) were above 0.5 (Fornell & Larcker, 1981). We obtained evidence
of discriminant validity as all AVEs exceeded the squared multiple correlations between the respective
constructs (Ping Jr., 2004) with the exception of the correlation between Procedural Justice from one side
and Interactional Justice, Distributive Justice and Complaint Satisfaction from the other side. In addition,
the correlation between Distributive Justice and Complaint Satisfaction and the correlation between
Customer Satisfaction and Customer Loyalty were also higher than the AVEs. However, correlations
between these constructs significantly differed from unity. This would hence present further evidence of
discriminant validity (Anderson & Gerbing, 1988; Bagozzi & Phillips, 1982; Steenkamp & Van Trijp, 1992;
Ping Jr., 2004).

Table 1: Measurement Model Reliability and Average Variance Extracted

<table>
<thead>
<tr>
<th>Construct</th>
<th>Item</th>
<th>λ</th>
<th>θδ</th>
<th>Variance Extracted A</th>
<th>Variance Extracted B</th>
<th>Composite Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedural Justice</td>
<td>PJ1</td>
<td>0.83</td>
<td>0.32</td>
<td>0.686</td>
<td>0.689</td>
<td>0.814</td>
</tr>
<tr>
<td></td>
<td>PJ3</td>
<td>0.83</td>
<td>0.31</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interactional</td>
<td>IJ1</td>
<td>0.78</td>
<td>0.38</td>
<td>0.628</td>
<td>0.623</td>
<td>0.860</td>
</tr>
<tr>
<td>Justice</td>
<td>IJ2</td>
<td>0.71</td>
<td>0.49</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IJ4</td>
<td>0.87</td>
<td>0.24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IJ5</td>
<td>0.79</td>
<td>0.37</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distributive</td>
<td>DJ2</td>
<td>0.73</td>
<td>0.47</td>
<td>0.647</td>
<td>0.649</td>
<td>0.846</td>
</tr>
<tr>
<td>Justice</td>
<td>DJ3</td>
<td>0.87</td>
<td>0.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DJ4</td>
<td>0.81</td>
<td>0.34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complaint</td>
<td>COMPS1</td>
<td>0.73</td>
<td>0.47</td>
<td>0.626</td>
<td>0.628</td>
<td>0.769</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>COMPS3</td>
<td>0.85</td>
<td>0.28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer</td>
<td>SAT1</td>
<td>0.86</td>
<td>0.25</td>
<td>0.657</td>
<td>0.651</td>
<td>0.792</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>SAT3</td>
<td>0.75</td>
<td>0.43</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer</td>
<td>LOY1</td>
<td>0.87</td>
<td>0.24</td>
<td>0.778</td>
<td>0.780</td>
<td>0.913</td>
</tr>
<tr>
<td>Loyalty</td>
<td>LOY2</td>
<td>0.88</td>
<td>0.23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LOY3</td>
<td>0.90</td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The table shows the composite reliability measures for the model constructs.

A test of common method variance was performed. The reason for conducting such tests was to have an
additional scrutiny of the validity of the results since common method variance was described as one of the
main sources of systematic measurement error (Podsakoff et. al., 2003). Initially several ad-hoc design
considerations were followed as recommended by Podsakoff and Organ as means to reduce common
method bias namely protecting respondent anonymity and reducing evaluation apprehension,
counterbalancing question order, and improving scale items, as also suggested by Podsakoff et al. (2003).
A post-hoc statistical patching up further complemented this effort. In this regard, Harman’s single factor
test was used (Podsakoff et. al., 2003). The basic assumption of this technique is that if a substantial amount
of common method variance is present, either (a) a single factor will emerge from the factor analysis or (b)
one general factor will account for the majority of the covariance among the measures. The Harman’s
single-factor test when applied to this research resulted in the absence of one general factor that emerges
from the analysis in addition to the absence of one general factor that accounts for the majority of the
covariance among measures.
Table 2: Average Variance Extracted and Squared Correlation Measurement Model

<table>
<thead>
<tr>
<th>Construct</th>
<th>Procedural Justice</th>
<th>Interactional Justice</th>
<th>Distributive Justice</th>
<th>Complaint Satisfaction</th>
<th>Customer Satisfaction</th>
<th>Customer Loyalty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedural Justice</td>
<td>0.686</td>
<td>0.774</td>
<td>0.810</td>
<td>0.828</td>
<td>0.672</td>
<td>0.624</td>
</tr>
<tr>
<td>Interactional Justice</td>
<td>0.880</td>
<td>0.628</td>
<td>0.548</td>
<td>0.608</td>
<td>0.533</td>
<td>0.423</td>
</tr>
<tr>
<td>Distributive Justice</td>
<td>0.900</td>
<td>0.740</td>
<td>0.647</td>
<td>0.865</td>
<td>0.608</td>
<td>0.504</td>
</tr>
<tr>
<td>Complaint Satisfaction</td>
<td>0.910</td>
<td>0.780</td>
<td>0.930</td>
<td>0.626</td>
<td>0.640</td>
<td>0.504</td>
</tr>
<tr>
<td>Customer Satisfaction</td>
<td>0.820</td>
<td>0.730</td>
<td>0.780</td>
<td>0.800</td>
<td>0.657</td>
<td>0.865</td>
</tr>
<tr>
<td>Customer Loyalty</td>
<td>0.79</td>
<td>0.65</td>
<td>0.71</td>
<td>0.71</td>
<td>0.93</td>
<td>0.778</td>
</tr>
</tbody>
</table>

Average Variance Extracted appears in the Matrix Diagonal  Correlation Matrix appears below the diagonal
Squared correlations appear above the diagonal

Analysis of the Structural Model for Complaint Handling

Having assessed the measurement model, the structural relations were added. The equations for the structural relations are shown below:

\[ COMPS = \gamma_1 (PJ) + \gamma_2 (IJ) + \gamma_3 (DJ) \]  
\[ SAT = \beta_1 (COMPS) \]  
\[ LOY = \beta_2 (COMPS) + \beta_3 (SAT) \]

In terms of the overall model fit, the model’s goodness of fit indices are within thresholds indicating good fit: \( \chi^2 = 170.12 \) (p=0.000), DF=95, \( \chi^2/df=1.79 \), RMSEA= 0.048, GFI = 0.94, AGFI= 0.91, NNFI= 0.99, CFI= 0.99 and standardized RMR = 0.031. These results suggest that overall the model fits well to the data. The results presented in Table 3 below show that four out of the six hypothesized relationships were supported. For instance, Procedural justice (\( \gamma = 0.53, t = 1.96 \)) and Distributive justice (\( \gamma = 0.47, t = 2.75 \)) were found as predictors of complaint satisfaction, together explaining 96% of its variance. Interactional Justice on the other hand and contrary to what was hypothesized failed to be a statistically significant predictor of Complaint Satisfaction (\( \gamma = 0.00, t = -0.01 \)). As for overall Customer Satisfaction, as hypothesized, Complaint Satisfaction (\( \beta = 0.84, t = 12.69 \)) was found as a predictor for Customer Satisfaction explaining 70% of its variance. Finally, while overall Customer Satisfaction (\( \beta = 0.99, t = 7.25 \)) was found to be a significant predictor of Customer Loyalty, the direct relationship between Complaint Satisfaction and Customer Loyalty was not supported by the model.

These results present Customer Satisfaction as a mediator of the relationship between Complaint Satisfaction on one side and Customer Loyalty on the other. This result is further corroborated in the forthcoming Table 4, where the indirect effect of Complaint Satisfaction can be clearly seen. As highlighted by Diamantopoulos and Siguaw (2000), statistical power assessment is an important but often neglected issue in model evaluation that is the probability that an incorrect model will be rejected. For the proposed model, and to assess the power associated with testing for exact fit, tables compiled by MacCallum, Browne and Sugawara (1996, p.144) were used. In order to attain a minimum power of 80% which was deemed sufficient by Diamantopoulos and Siguaw (2000) there must be a minimum sample size. In the case of this research, degrees of freedom are 95 and hence the minimum sample size for exact fit is 136. Given that the sample size for this research is 330, it can be inferred that the power of the analysis is good.
Table 3: Structural Relations and Hypothesis Testing

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Path</th>
<th>Estimate</th>
<th>SE</th>
<th>T-Value</th>
<th>R²</th>
<th>Hyp.</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedural Justice → Complaint Satisfaction</td>
<td>γ</td>
<td>0.53</td>
<td>0.28</td>
<td>1.96**</td>
<td>H1</td>
<td>Supported</td>
<td></td>
</tr>
<tr>
<td>Interactional Justice → Complaint Satisfaction</td>
<td>γ</td>
<td>0.00</td>
<td>0.15</td>
<td>-0.01</td>
<td>H2</td>
<td>Not Supported</td>
<td></td>
</tr>
<tr>
<td>Distributive Justice → Complaint Satisfaction</td>
<td>γ</td>
<td>0.47</td>
<td>0.17</td>
<td>2.75***</td>
<td>H3</td>
<td>Supported</td>
<td></td>
</tr>
<tr>
<td>Complaint Satisfaction → Customer Satisfaction</td>
<td>β</td>
<td>0.84</td>
<td>0.07</td>
<td>12.69***</td>
<td>H4</td>
<td>Supported</td>
<td></td>
</tr>
<tr>
<td>Customer Satisfaction → Customer Loyalty</td>
<td>β</td>
<td>0.99</td>
<td>0.14</td>
<td>7.25***</td>
<td>H5</td>
<td>Supported</td>
<td></td>
</tr>
<tr>
<td>Complaint Satisfaction → Customer Loyalty</td>
<td>β</td>
<td>-0.06</td>
<td>0.12</td>
<td>-0.54</td>
<td>H6</td>
<td>Not Supported</td>
<td></td>
</tr>
</tbody>
</table>

*, **, *** indicates significance at the 10, 5 and 1 percent levels respectively. The table shows the values of the path coefficients, their significance tests and the R-squared measures for the structural model.

Table 4: Effect Decomposition

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Direct Effect</th>
<th>Indirect Effect</th>
<th>Total Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedural Justice → Complaint Satisfaction</td>
<td>0.53</td>
<td>0.00</td>
<td>0.53</td>
</tr>
<tr>
<td>Interactional Justice → Complaint Satisfaction</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Distributive Justice → Complaint Satisfaction</td>
<td>0.47</td>
<td>0.00</td>
<td>0.47</td>
</tr>
<tr>
<td>Procedural Justice → Customer Satisfaction</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Interactional Justice → Customer Satisfaction</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Distributive Justice → Customer Satisfaction</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Complaint Satisfaction → Customer Satisfaction</td>
<td>0.84</td>
<td>0.00</td>
<td>0.84</td>
</tr>
<tr>
<td>Procedural Justice → Customer Loyalty</td>
<td>0.00</td>
<td>0.41</td>
<td>0.41</td>
</tr>
<tr>
<td>Interactional Justice → Customer Loyalty</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Distributive Justice → Customer Loyalty</td>
<td>0.00</td>
<td>0.36</td>
<td>0.36</td>
</tr>
<tr>
<td>Customer Satisfaction → Customer Loyalty</td>
<td>0.99</td>
<td>0.00</td>
<td>0.99</td>
</tr>
<tr>
<td>Complaint Satisfaction → Customer Loyalty</td>
<td>-0.07</td>
<td>0.83</td>
<td>0.76</td>
</tr>
</tbody>
</table>

This table shows the decomposition of the total effects to direct and indirect effects in the relation between each of the three complaint handling justice constructs and complaint satisfaction, overall customer satisfaction and customer loyalty respectively. When the indirect effect is larger than the direct effect, this may indicate the presence of a mediating construct, in this case Complaint Satisfaction.

Industry Type

As mentioned earlier on the section on data and methodology, the sample included complaints filed in ten different industries. One of the interesting and novel contributions of the current study is to show variance among industries in the degree of perceived justice in complaint handling, as well as the degree of customer satisfaction and loyalty as a result of complaint satisfaction. This analysis promises useful insights that may inform complaint-handling practice in the various industries. We tested for differences in the endogenous constructs, Complaint Satisfaction, overall Customer Satisfaction and Customer Loyalty, according to the industry using ANOVA with post-hoc Scheffe test. The results show that perceptions of procedural justice are significantly higher in in Cafés and Restaurants than in Banking and Investment (Sig.0.021), Automotive Industry (Sig. 0.056) and Internet Service Providers - ISPs (Sig. 0.028). Perceptions of Interactional Justice are significantly higher in Cafés and Restaurants than in the ISP (Sig. 0.083) industry. Perceptions of Distributive Justice are also significantly higher in Cafés and Restaurants than in the Automotive (Sig. 0.023) and ISP (Sig. 0.095) industries.

These results possibly indicate that in Egypt, Cafés and Restaurants have better complaint handling systems than Banking, Automotive and ISP businesses. The same tests were also conducted to explore the industry differences in the levels of complaint satisfaction, overall customer satisfaction and customer loyalty after the complaint. The results show no significant differences between industries in the levels of complaint satisfaction. Both the Mobile Operators (Sig. 0.002) and Cafés and Restaurants (Sig. 0.024) showed markedly higher levels of overall customer satisfaction after the complaint than in Banking and Investment. Moreover, levels of customer loyalty after the complaint were higher for Mobile operators than they were for Automotive (Sig. 0.038), Banking and Investment (Sig. 0.000) and Hospitals (Sig. 0.09). Cafés and
Restaurants also showed higher levels of customer loyalty after the complaint than Automotive (Sig. 0.079), Banking and Investment (Sig. 0.003) and Hospitals (Sig. 0.017). These results possibly imply higher levels of satisfaction and loyalty in Mobile Operators and Cafés and Restaurants, which suggests that in Egypt, these industries are more successful in keeping their customers happy and retaining them after complaints. On the other hand, customers are less satisfied and loyal to businesses in Banking and Investment and in the Automotive industry after complaints. Business operating in these industries may need to make more investments in their complaint handling systems.

CONCLUDING COMMENTS

This study extends previous literature on complaint handling processes and their impact on customer satisfaction and loyalty and applies the resulting conceptual model to a novel context, namely Egypt. Moreover, the study draws on a relatively large sample from ten different service industries, which enriched previous findings in the literature. One of the key findings of the study points to a higher impact of procedural justice than distributive justice on complaint satisfaction. This result is consistent with Maxham and Netemeyer (2002) and Gelbrich and Roschk (2011). The implication is that often customers care more about being heard, and having their complaint handled in a timely manner as well as feeling they had control over the process than the actual outcome they get. The study has shown that overall customer satisfaction after the complaint mediates the impact of complaint-handling justice on customer loyalty after the complaint. Therefore, it is imperative that companies make sure their customers perceive their complaint handling procedures and outcomes to be fair and are satisfied with the complaint handling experience. The current study has shown that this is an important mechanism if the business aims at retaining its customers and enhancing customer loyalty. Specific implications for particular industries are an important contribution of the study and have been alluded to in the previous section. A key lesson is that several of the service industries examined in this study need to focus on their complaint handling systems and adopt valid measures to track customer satisfaction and loyalty. It is important to note that the results of the study have are limited to the Egyptian context, and more specifically to customers living in the capital cities of the two biggest Egyptian governorates, namely Cairo and Alexandria. Future research on the topic may fruitfully conduct the research from the perspective of the employees to understand how they seek customer complaint satisfaction and how to make customer complaint satisfaction part of the corporate culture. Moreover, moderating variables like brand may be tested and cross-cultural comparisons between Egyptian customers and customers from other nationalities may yield interesting insights.

REFERENCES


**BIOGRAPHY**

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SMALL BUSINESS EMPLOYEES PERCEPTIONS OF THE WORK ENVIRONMENT IN SOUTHERN MEXICO

María del Carmen Sandoval Caraveo, Universidad Juárez Autónoma de Tabasco
Adriana Mariela de la Cruz Caballero, Instituto Tecnológico Superior de Centla Tabasco
Edith Georgina Surdez Pérez, Universidad Juárez Autónoma de Tabasco

ABSTRACT

This article identifies the organizational environment prevailing in a self-service business located in Tabasco, Mexico. The research is descriptive and correlational. It is a cross-sectional non-experimental study with a quantitative approach. The questionnaire used consists of 32 items, which analyzed eight dimensions of organizational climate; structure, motivation, communication, identity, reward, recognition, companionship and support. Reliability of the research instrument was 0.931 calculated using Cronbach’s alpha coefficient. The data analysis was made by descriptive statistics, analysis of variance and Pearson correlation. Twenty-seven percent of the population experiences an unfavorable organizational climate and 23% experience a favorable climate. The structure dimension has the highest average and the reward dimension the lowest average. Analysis of variance showed no statistically significant differences between the dimensions of organizational climate and sociodemographic variables. We conclude that favorable organizational climate occurs more in the dimensions of structure, identity and communication. An unfavorable climate was found in rewards. This dimension showed a negative correlation with the age of workers which indicates that older workers believe they are less rewarded.

JEL: L26

KEYWORDS: Work Environment, Organizational Climate, Business, Employees

INTRODUCTION

The study of organizational climate has become more significant as organizations develop new ways of working give more importance to the context in which workers perform their duties. In all types of organizations the proper administration of the human factor is very valuable as it is the most important capital the firm has. Companies are able to achieve their goals more efficiently if people are committed to them. Therefore human needs require special attention.

One determining factor of employee performance is the work environment. The work environment can be a link or an obstacle to proper company performance. It can also be a factor of distinction and influence on the behavior of those within it. Organizational climate establishes how people perceive their performance, job, satisfaction and productivity in an organization and has been associated in the literature as a key factor in productivity of organizations. For these reasons, a suitable working environment is essential for workers to perform their activities efficiently and effectively. However it is sometimes difficult to achieve a climate according to the needs of individuals, because organizational climate is constantly changing due to the influence of external and internal factors. A work environment unfavorable to employee functions is source of conflict, loss of enthusiasm for the work and affects their level of satisfaction. It is also likely to cause absence and hence low productivity as opposed to individuals working in a favorable climate.
The aim of this study was to identify the organizational climate prevailing in a self-service company located in Tabasco, Mexico. Dimensions that conform the work environment of the company were analysed. These dimensions include structure, motivation, communication, identity, reward, recognition, affiliation and support. The existence of significant statistically differences between sociodemographic variables and dimensions were determined and the existence of correlation between dimensions of organizational climate with workers of the company’s age and seniority was identified.

The paper is organized in the following way: The first section introduces organizational climate and work environment and the importance it represents for companies. The second section provides a theoretical development by some authors who have given definitions of organizational climate and have emphasized its association as part of the quality of work life. The third section explains the objectives of the research, the fourth part presents the methodology. Finally the results and conclusions are provided.

LITERATURE REVIEW

García and Sanchez (2006) indicate that most research on organizational climate considers Lewin as the introducer of climate construct in relation to the study and analysis of organizations. Soria (2008) mentions that the study of organizational climate comes from diverse backgrounds and has roots in studies of Lewin in 1951 on "experimentally created social climates." He adds that implementation of the term climate in organizational studies was done by Litwin and Stringer in 1968 and Likert in 1967. It was later extended to the organizational psychology. The same author notes that in the mid-nineties Denison based his study on three main topics: measuring perceptions of individual attributes (psychological climate) measuring perceptions of organizational attributes (organizational climate) and the joint and combined measurement of individual perception and the objective perception of the organization’s attributes.

Dessler (1996) argues that studies analyzing organizational environment are divided into three categories: First are those that see organizational climate as an independent variable. Second are those that treat climate as an interposed variable. Finally some treat climate as a dependent variable. Climate occurs as an independent variable is when the weather is considered a factor on things like employee satisfaction. Climate as an interposed variable exists when organizational climate acts as an intermediary to link elements like structure with the satisfaction or employee performance. Organizational climate as dependent variable occurs when factors such as technology, structure, leadership and administrative practices, have influence over organizational climate.

When we talk about organizational climate we must mention the significant contribution of Likert (1974 cited by Brunet, 1997) and his theory of organizational climate. This theory states the performance of company management and the conditions of the organization perceived by employees, are responsible for the behavior of individuals, their hopes, values and skills. In this line of thought, Brunet (1997) affirms that an individual's reaction to certain situations depends on his or her perception of it. What matters is how things are seen rather than objective reality. If reality influences perception, this determines the type of behavior that an individual adopts. For this reason the four main factors that influence an individual's perception about organization climate are: a) the parameters related to the context, technology and the organizational system structure; b) the hierarchical position the individual occupies in the organization as well as the salary earned; c) personal factors such as personality, attitudes and satisfaction d) the impression he or she has of the subordinates, colleagues and superiors of organizational climate (p.28).

Likert notes three types of variables that determine the characteristics of an organization and influence individual perceptions of climate: causal variables, intermediate variables and final variables. Causal variables, also called independent variables, are intended to indicate the direction in which an organization evolves and gets results. Within these variables are the organizational structure and its management, rules, decisions, skills and attitudes. If independent variables are modified the other variables change.
Intermediate variables reflect the internal state and health of a company and constitute the organizational processes of a company. These include motivation, attitude, goals, effective communication and decision making. The final variables, also called dependent, are those resulting from the effect of the independent variables and the results of the company, profits and losses (Brunet, 1997, p. 29).

The concept of organizational climate has been defined by several authors such as Hall (1996) who defines it as a set of environmental properties, perceived directly and indirectly by the workers, and are supposed to be a force that influences their behavior. Caligiore and Diaz (2003) conceptualize organizational climate as the interaction of elements that form the organization such as the structure, organizational processes and the behavior of groups and individuals.

Watkin and Hubbard (2003) argue that organizational climate is “how it feels to work in a particular environment for a particular boss”. Sandoval (2004) argues that organizational climate is the work environment perceived by organization members and includes structure, leadership style, communication, motivation and rewards. These factors all influence directly the behavior and performance of individuals. Chiavenato (2007) describes organizational climate as the quality or property of the organizational environment perceived or experienced by organization members and which influences their behavior.

Organizational climate describes an organization, distinguishes it from others and influences the behavior of people conforming it. In addition, it gathers organizational aspects such as practices, policies, leadership, conflict, systems of rewards and punishments, control and supervision, as well as distinctive features of the organization’s physical environment (Vega, Arévalo, Sandoval, Aguilar and Giraldo 2006). Organizational climate reflects the deepest culture of the organization and determines how the worker perceives his job, efficiency, productivity and satisfaction in the work performed (Quintero, Africano and Faria, 2008).

Brunet (1997) explains that any work situation involves a set of specific factors in the individual including skills and physical, psychological characteristics, social and physical environments. Each of these elements have their own characteristics. Therefore the individual appears as immersed in a climate determined by the particular nature of the organization. According to Hellriegel and Scolum (1999) it is common that different people perceive a situation differently. They perceive selectively. They organize and interpret the situation perceived. Each person gives different meanings to the stimuli received, indicating that different people will see the same thing in different ways. In the workplace, employee behavior is determined by how he sees a situation or reacts to stimuli.

Salgado, Remeseiro and Iglesias (1996) report that there is a widespread agreement that organizational climate is composed of different dimensions that characterize particular aspects of organizational environment. However, the number of these dimensions varies according to the criteria of authors in this subject. Authors such as Casas, Repullo, Lorenzo and Cañas (2002) and Chiavenato (2009) relate work environment with quality of life at work. They argue work environment is associated with factors such as compensation and human relations that are relevant to satisfaction, motivation and job performance. They note a climate of trust and respect tends to improve the performance of workers.

Organizations such as the Mexican Institute of Standardization and Certification [IMNC in Spanish] associates work environment with quality management. It mentions that all types of institutions should assure a work environment that promotes initiatives to improve quality on services provision to users and to facilitate the media and suitable conditions at the respective job positions (IMNC, 2001, quoted by Alcántar, Maldonado and Arcos 2012).

At present the issue of organizational climate is of great importance to almost every organization looking for continuous improvement of the work environment. They wish to achieve an increase in productivity without forgetting about human resources. Knowledge guides processes that determine organizational
behavior, and allow changes in both performance of members and in organizational structure (Mújica and Pérez, 2007). Organizational climate is definitive in the decision making of an organization and in the way in which personal relationships inside and outside of it are managed. For this reason, to have positive effects in the organization it is necessary to have a satisfactory climate. This may bring many benefits to the company and hence its position in the competitive world (Peña, Díaz and Olivares, 2015).

One determining factor on the performance of employees is the work environment. Work environment may represent a link or an obstacle to company performance. It could be a factor that has a significant influence on behavior of those who compose it.

It is important for an organization to perform studies of organizational climate. These studies provide feedback about processes that determine organizational behavior, giving information to make decisions regarding necessary changes relating to the conduct of workers and the organizational structure. An improvement of the work climate of the company will impact the effectiveness and efficiency of the organization.

METHODOLOGY

The investigation here is descriptive. We assess and collect data of various concepts (variables), aspects, dimensions or components of the phenomenon to investigate. In a descriptive study a number of issues are selected and information about each is measured or collected. In this way we describe what is researched (Hernández, Fernández and Baptista 2006). The design is quantitative, cross-sectional and non-experimental. Non-experimental studies are performed without the deliberate manipulation of variables and the phenomena are only observed in their natural environment and then analyzed. The transectional or cross-sectional collection of data at a single moment, in one time, describes variables and analyzes their effect and interaction in a given time (Hernandez et. al. 2006).

Individuals of Study

The population studied in this research was the staff of a self-service business located in Tabasco, Mexico. The sample consists of a total of 64 employees working in different shifts. It was not necessary to extract a sample because the population is made up of a small number of employees so a census was conducted. The following figures indicate the classification of individuals by gender, age, marital status, highest level of education and seniority in the company. Table 1 shows the total number of individuals working in the business and provides data on the gender makeup of the sample. The population analyzed in this research is comprised of 35.9% women while men represent 64.1% of the population.

Table 1. Frequency Distribution by Gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>41</td>
<td>64.1</td>
<td>64.1</td>
</tr>
<tr>
<td>Female</td>
<td>23</td>
<td>35.9</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

This table shows the number of individuals working in the business classified by gender. Of the 64 study subjects, 41 are men and 23 are women.

Table 2 indicates the number of individuals working in the company and the classification by age. People within the range of 18-22 years old represent 29.7% of the sample. Those within the range of 23 to 27 years old represent 37.5% of the sample. Those between 28 and 32 years represent 10.9%, while those between 33-37 years of age represent 14.1%. Those between 38 and 42 years represent 7.8% of the population tested.
Table 2: Frequency Distribution by Age

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 a 22</td>
<td>19</td>
<td>29.7</td>
<td>29.7</td>
</tr>
<tr>
<td>23 a 27</td>
<td>24</td>
<td>37.5</td>
<td>67.2</td>
</tr>
<tr>
<td>28 a 32</td>
<td>7</td>
<td>10.9</td>
<td>78.1</td>
</tr>
<tr>
<td>33 a 37</td>
<td>9</td>
<td>14.1</td>
<td>92.2</td>
</tr>
<tr>
<td>38 a 42</td>
<td>5</td>
<td>7.8</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This table shows the listing of number of employees according to their age. The most common group of individuals is between 23 and 27 years old. The least common individuals are between 38 and 42 years old.

Table 3 shows the number of individuals working in the company and the classification according to their marital status. Table 3 shows that 54.7% of the study subjects are single and the remaining 45.3% are married.

Table 3: Frequency Distribution by Marital Status

<table>
<thead>
<tr>
<th>Marital status</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>35</td>
<td>54.7</td>
<td>54.7</td>
</tr>
<tr>
<td>Married</td>
<td>29</td>
<td>45.3</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This table shows the number of employees classification according to their marital status. Of the 64 employees in the company, 35 are single and 29 are married.

Table 4 indicates the number of individuals working in the company and the classification according to their schooling. Some 20.3% of the population has secondary school level, 59.4% has high school and 20.3% has bachelor degree.

Table 4: Frequency Distribution by Highest Level of Studies

<table>
<thead>
<tr>
<th>Level of studies</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middleschool</td>
<td>13</td>
<td>20.3</td>
<td>20.3</td>
</tr>
<tr>
<td>High school</td>
<td>38</td>
<td>59.4</td>
<td>79.7</td>
</tr>
<tr>
<td>Degree</td>
<td>13</td>
<td>20.3</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This table shows the employees classification according to their schooling. Thirty-eight employees studied until high school. Another 13 studied middle school. Thirteen also obtained a degree.

Table 5 highlights the number of individuals working in the company and classifies them by seniority in the firm. Some 32.8% of the employees have worked less than a year, 32.8% have a period of between 1 and 2 years in the company, 17.2% have a seniority of 2-3 years, while 17.2% have worked for more than 3 years.

Table 5: Frequency Distribution of Seniority of Employees in the Company

<table>
<thead>
<tr>
<th>Seniority of employees in the Company</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than a year</td>
<td>21</td>
<td>32.8</td>
<td>32.8</td>
</tr>
<tr>
<td>1 a 2 years</td>
<td>21</td>
<td>32.8</td>
<td>65.6</td>
</tr>
<tr>
<td>2 a 3 years</td>
<td>11</td>
<td>17.2</td>
<td>82.8</td>
</tr>
<tr>
<td>More than 3 years</td>
<td>11</td>
<td>17.2</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This table shows the number of employees in the company according to seniority. Twenty-one workers have been with the firm less than one year in the company. Another 21 have been with the company from 1-2 years in it. Eleven employees have been with the firm from 2-3 years and the same number of workers have been with the company than three years.
Data Collection Instrument and Data Analysis

The questionnaire of Berra and García (2003) is used in this research to measure organizational climate. An adaptation of the survey was made by including some elements of questionnaires by Alanis (2004), Schreiner (2004) and Mercado (2005). The final questionnaire consists of 32 items that analyze eight dimensions of organizational climate; structure, motivation, communication, identity, reward, recognition, companionship and support. Each dimension of organizational climate was measured by four items with 5 possible answers on a Likert scale ranging from 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree and 5 = totally agree. The reliability of the research instrument was calculated using Cronbach’s alpha coefficient which reported 0.931. Data analysis was performed using SPSS statistical software. Table 6 explains the research tool. It shows the dimensions of organizational climate that were analyzed in this research, the operational definition of each one as well as every question corresponding to each dimension.

Table 6: Specifications of Organizational Climate Questionnaire

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Operational Definition</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td>Perception of obligations, rules and policies found in an organization.</td>
<td>I am aware of the goals and company objectives.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I believe that my duties and responsibilities are clearly defined.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I always participate in the regulation of procedures to do my job.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I know whom I report my achievements, problems and needs.</td>
</tr>
<tr>
<td>Motivation</td>
<td>This dimension deals with the motivational aspects that the organization produces on its employees.</td>
<td>I am satisfied with the work I do.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I consider my work environment is appropriate.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I think I receive a fair treatment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My boss motivates me to do my tasks.</td>
</tr>
<tr>
<td>Communication</td>
<td>This dimension is based on the communication networks that exist inside the organization and also the ease that employees have, to make their demands heard at the direction department.</td>
<td>There is good communication with my boss.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is good communication with my coworkers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I usually inform my boss about ideas or suggestions of the work I execute.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My boss’ orders are clear and accurate.</td>
</tr>
<tr>
<td>Identity</td>
<td>It is the feeling of belonging to the company and the sense of being a valued member of a team; the importance attached to that spirit.</td>
<td>I feel an important part of this company.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I am aware of my contribution in achieving the objectives of the company.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I enjoy working in the company.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I can relate to the mission, values and philosophy of the company.</td>
</tr>
<tr>
<td>Reward</td>
<td>This refers to how workers are remunerated (wages, social benefits, etc.)</td>
<td>I feel my salary is proportional to my job performance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I am well remunerated for my work performance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>According to my expectations and needs, my salary is enough.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My salary is higher than that of other employees on similar positions in other companies.</td>
</tr>
<tr>
<td>Recognition</td>
<td>This aspect is based on the distinction that a worker receives from his boss.</td>
<td>My boss recognizes my effort at performing my duties.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In recent weeks I have received praise for the work I've done.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>By doing something good I always get the recognition I need.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My boss recognizes the rights, dignity and decorum of employees.</td>
</tr>
<tr>
<td>Affiliation</td>
<td>This dimension is based on the friendship and support relations between employees.</td>
<td>My coworkers appreciate me.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My boss is tolerant when I make a labor mistake.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My colleagues and I help each other when there is overwork.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My boss actually helps me and my colleagues in conducting my activities.</td>
</tr>
<tr>
<td>Support</td>
<td>This dimension refers to the support and encouragement that direction department gives to its employees.</td>
<td>My boss helps me to solve my work problems.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My boss gives me the necessary information to perform my job.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My boss takes into account my ideas and suggestions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If there is a problem I have the confidence to go to my boss.</td>
</tr>
</tbody>
</table>

This table explains the operational definition of each dimension of organizational climate and it shows the items that correspond to each of them.

The questionnaire was completed by 100% of the individuals who formed the census. It was applied in the period August-September 2014 and it was distributed at the work area of each person.
RESULTS

Descriptive Statistics

Scores obtained in the scale were analyzed using a frequency distribution approach. A normal distribution is observed with a minimum value of 84 and a maximum value of 156, an average of 120.79 and a standard deviation of 16.07. Quartiles of the distribution were identified to establish analysis categories which are shown in Table 7.

Table 7: Acceptance Levels of Organizational Climate, Value Range (Rating Scale 32-160)

<table>
<thead>
<tr>
<th>Perception Level of Organizational Climate</th>
<th>Percentile</th>
<th>Rank</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unfavorable organizational climate</td>
<td>25</td>
<td>84-111</td>
<td>27%</td>
</tr>
<tr>
<td>Moderately favourable organizational climate</td>
<td>50</td>
<td>112-122</td>
<td>27%</td>
</tr>
<tr>
<td>Favourable organizational climate</td>
<td>75</td>
<td>123-130</td>
<td>23%</td>
</tr>
<tr>
<td>Highly favourable organizational climate</td>
<td>100</td>
<td>131-156</td>
<td>23%</td>
</tr>
</tbody>
</table>

This table shows the percentages obtained from the level of perception of organizational climate calculated from the total sum of the responses. 27% of the population perceives an unfavorable organizational climate while 23% perceive it as highly favorable.

Descriptive statistics are presented in the following tables in order to understand the behavior of each dimension. Table 8 presents the dimensions of organizational climate and result obtained from the averages and standard deviation. The number of workers who responded to the research instrument is also observed.

The dimension of structure has the highest average (17.04), indicating that workers are very familiar with the objectives and goals of the company. They consider their responsibilities to be well defined and externalize their participation in the procedures used in their work. The dimensions of identity (16.60), communication (16.32), affiliation (15.87) and motivation (15.35) have also averages indicating a positive organizational climate. It is perceived that employees feel proud to belong to the company. The exchange of information and good relations prevail between them and their boss, and they are motivated to perform their functions. Dimensions of support (14.78) and recognition (13.57) have a perception that tends to be moderately favorable. The dimension of reward has the lowest average (11.21) showing that individuals in this organization believe they are not properly paid for their work.

Table 8: Shows The Sums of Each Dimension Obtained in the Descriptive Statistics.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Average</th>
<th>Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td>64</td>
<td>11.00</td>
<td>20.00</td>
<td>17.046</td>
<td>2.0734</td>
</tr>
<tr>
<td>Motivation</td>
<td>64</td>
<td>10.00</td>
<td>20.00</td>
<td>15.359</td>
<td>2.3662</td>
</tr>
<tr>
<td>Communication</td>
<td>64</td>
<td>7.00</td>
<td>20.00</td>
<td>16.328</td>
<td>2.3708</td>
</tr>
<tr>
<td>Identity</td>
<td>64</td>
<td>8.00</td>
<td>20.00</td>
<td>16.609</td>
<td>2.3745</td>
</tr>
<tr>
<td>Reward</td>
<td>64</td>
<td>4.00</td>
<td>20.00</td>
<td>11.218</td>
<td>3.7351</td>
</tr>
<tr>
<td>Recognition</td>
<td>64</td>
<td>7.00</td>
<td>20.00</td>
<td>13.578</td>
<td>3.1763</td>
</tr>
<tr>
<td>Affiliation</td>
<td>64</td>
<td>9.00</td>
<td>20.00</td>
<td>15.875</td>
<td>2.2074</td>
</tr>
<tr>
<td>Support</td>
<td>64</td>
<td>4.00</td>
<td>20.00</td>
<td>14.781</td>
<td>3.2828</td>
</tr>
</tbody>
</table>

This table indicates the average and standard deviation obtained from the sums of all responses of the research instrument. The highest average was found in the dimension of structure and the lowest average in recognition.

Comparison of Averages To determine whether there are significant differences between the dimensions of organizational climate and socio-demographic variables, we used ANOVA analysis for gender, age, marital status, seniority of the worker in the company and the highest level of education. The results did not show significant statistically differences between the dimensions of organizational climate and sociodemographic variables.
Correlation Analysis

Pearson correlation coefficient was used to determine the existence of correlation between sociodemographic variables of employees’ age and seniority in the company and the dimensions of organizational climate. Table 9 shows the results of this calculation.

Table 9: Dimensions of Organizational Climate Correlation with Seniority and Age

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Age</th>
<th>Seniority</th>
<th>Structure</th>
<th>Motivation</th>
<th>Communication</th>
<th>Identity</th>
<th>Reward</th>
<th>Recognition</th>
<th>Affiliation</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1</td>
<td>-0.055</td>
<td>-0.072</td>
<td>-0.058</td>
<td>-0.105</td>
<td>-0.272</td>
<td>-0.108</td>
<td>-0.019</td>
<td>-0.063</td>
<td></td>
</tr>
<tr>
<td>Seniority</td>
<td>1</td>
<td>0.06</td>
<td>-0.2</td>
<td>0.05</td>
<td>-0.027</td>
<td>0.097</td>
<td>-0.004</td>
<td>0.11</td>
<td>-0.06</td>
<td></td>
</tr>
<tr>
<td>Structure</td>
<td>1</td>
<td>0.226</td>
<td>0.526(*)</td>
<td>0.484(**)</td>
<td>0.251(*)</td>
<td>0.386(*)</td>
<td>0.300(*)</td>
<td>0.204</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motivation</td>
<td>1</td>
<td>0.513(*)</td>
<td>0.655(**)</td>
<td>0.368(**)</td>
<td>0.620(**)</td>
<td>0.525(**)</td>
<td>0.533(**)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>1</td>
<td>0.694(**)</td>
<td>0.343(**)</td>
<td>0.662(**)</td>
<td>0.718(**)</td>
<td>0.723(**)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identity</td>
<td>1</td>
<td>0.373(**)</td>
<td>0.689(**)</td>
<td>0.632(**)</td>
<td>0.522(**)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reward</td>
<td>1</td>
<td>0.404(**)</td>
<td>0.09</td>
<td>0.303(*)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recognition</td>
<td>1</td>
<td>0.640(**)</td>
<td>0.795(**)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Affiliation</td>
<td>1</td>
<td>0.671(**)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Support</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

This table explains the correlation between sociodemographic variables of age and seniority of study subjects in the company and the dimensions of organizational climate. There was only one correlation which occurred between age of workers and their seniority in the company: ** Correlation is significant at the level 0.01 (bilateral). * Correlation is significant at the level 0.05 (bilateral).

The correlation analysis of sociodemographic variables and dimensions of organizational climate presented in Table 9 shows that only age has a weak negative significant correlation of r -0.272 * with the dimension of reward with a significant correlation coefficient of 0.05.

CONCLUSIONS

This paper examines the perception that personnel of a self-service business located in Tabasco, Mexico has of organizational climate. We survey the employees of the firm. The results show that 27% of the population perceives an unfavorable organizational climate, 27% perceives it as moderately favorable and 23% of the population perceives a favorable climate.

Descriptive statistics from the research instrument show an average of 4.26 was found in the structure dimension, 4.15 in the identity dimension, 4.08 in communication, 3.84 in motivation, 3.97 in affiliation, 3.69 in support, 3.39 in the dimension of recognition and 2.80 in reward. The structure dimension results coincide with those obtained by Berra (2003) who found that most of employees clearly understand the activities they must perform and are clear about the position they occupy within the company. The result of the motivation dimension also coincides with those of Berra (2003) as she identified that almost every individual of the company is satisfied with the work they do.

A very favorable organizational climate was found in the dimensions of structure, identity and communication based on data from descriptive statistics. A favorable climate was found in affiliation and motivation; a moderately favorable climate was identified in recognition and support, and an unfavorable climate was found in the dimension of reward.

With regard to the analysis of variability there were no significant differences between the dimensions of climate and socio-demographic variables. This implies that perception of the work environment is not influenced by age, gender, educational level and seniority. Correlation analysis between sociodemographic variables and dimensions of organizational climate show that only age has a weak negative correlation (-0.272*) with the dimension of reward. This finding implies that over the years workers perceive they are less rewarded. This result provides guidelines for future research to identify the causes why older workers feel their work is not fairly reward.
Organizational climate analysis conducted in this paper is expected to help directors of the company establish strategies and create a favorable work environment to develop worker's daily activities in this organization.

As limitations of this research is the results are only valid for the population studied. However the methodology could be replicated in other organisms of the same line of business which may allow comparative studies. Since the results show that unfavorable organizational climate is located in dimensions of reward and recognition, it is necessary to carry out further research to identify factors that, from workers’ perspective, can help to improve these elements of organizational climate.

REFERENCE


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FINANCIAL PERFORMANCE OF ISLAMIC AND CONVENTIONAL BANKS: EVIDENCE FROM JORDAN

Maysa’a Munir Milhem, Yarmouk University
Rasha M. S. Istaiteyeh, The Hashemite University

ABSTRACT

This article investigates the performance of Islamic banks versus conventional counterparts in Jordan over the period (2009-2013) using financial ratio analysis. A total of 16 banks (13 conventional and 3 Islamic) were considered. A comparative study is undertaken based on performance indicators, 13 financial ratios were estimated to measure performances in terms of profitability, liquidity, risk and solvency, and efficiency. T-test is used in determining their significance. The results show that there are differences in performance between Islamic and conventional banks in Jordan during study period in terms Islamic banks are less profitable, more liquid, less risky, and less efficient comparing to conventional banks. However, there was no significant difference in profitability ratios, but there was a significant difference in liquidity ratios and risk and solvency ratios between conventional and Islamic banks.

JEL: G21, G23

KEYWORDS: Bank Efficiency, Financial Ratios, Jordan, Islamic Banks, Conventional Banks

INTRODUCTION

The global expansion of Islamic finance in recent years has been spectacular. Prior to the financial crisis and according to the International Financial Service London (IFSL), Sharia compliant assets were estimated to have grown by over 10% a year from about $150 bn in the mid-1990s to $531bn by the end of 2006, with balance sheet assets of Sharia compliant banks totaled $463bn in 2006 (Elsiefy, 2013), and in 2011 total assets in Sharia-compliant financial institutions have doubled to $900 bn (Beck et al.; 2013). According to figures released by the Banker, global Islamic assets held by commercial banks exceeded US $1.8 trillion in 2013(Mallin et al., 2014). The impact of the financial crisis that originated in the United States and the euro zone hit the rest of the world (AlKulaib et al., 2013), and many investors and depositors began to worry about their investments and deposits, not only this, rather the european debt crisis that began in July 2011 is making headlines (AlKulaib et al., 2013). Therefore, the recent global financial crisis has not only shed doubts on the proper functioning of conventional “Western” banking, but has also increased the attention to Islamic banking, as some observers have pointed to their superior performance during the crisis (Beck et al., 2013).

Islamic banking has grown unabated since its inception in the mid-1970s. The industry has increasingly carved out a significant slice of the global financial market (Mallin et al., 2014). As one of the fastest growing sectors in the global financial services in the past three decades, Islamic finance has become noticeably significant in many countries, and consequently has gained enormous recognition and credibility worldwide. This evolution and widespread practice of Islamic finance has generated interest and discussions among both economists and policy makers about the practicality and viability of Islamic banking model especially on the back of the current financial, where which banks were one of its major players (Elsiefy, 2013). Islamic banks are therefore no longer limited to traditional Muslim regions, rather there are more than 300 Islamic financial institutions spread across 70 countries such as Malaysia and
several Middle Eastern countries (Beck et al., 2013). Indeed, there are 5 Islamic banks in the UK, and 19 Islamic financial institutions in the USA (Mobarek and Kalonov, 2014).

Conventional banking are based on interest, while Islamic banking follows Islamic Shariah as the basis of operation (Siraj and Pillai, 2012), that is based on three main prohibition practices, i.e. Riba (Interest), Gharar (Uncertainty), and Maysir (Betting) (Amba and Almukharreq, 2013; Beck et al.; 2013). That is, Islamic banking follows an equity approach than interest-based approach in both deposit and lending. Hence, to be able to compete with conventional banks, Islamic banks have to offer financial products that are comparable to the ones offered by conventional banks. This exposes Islamic banks to similar credit, liquidity and risks driven by market instability. Despite that, Islamic banks managed to remain stable at the early phases of the crisis that was driven by the fact that Islamic bank’s financing activities are more focused towards real economic activities. Second, conventional bank financial instruments such as Collateralized Debt Obligation-CDO, Cash Management bill-CMOs and Credit Default swap-CDOs considered as contributors to the financial crisis, where such instruments has no place among Islamic banks. Moreover, larger proportions of assets in Islamic banks are in illiquid form than their conventional counterparts. In addition, the absence of Lender of last resort facility and lack of interbank market to Islamic banks resulted in excess liquidity requirement.

Liquid asset ratio of Islamic banks in GCC for the year 2007 had been at a high of 21.14 percent according to the Council of Islamic Banks and Financial Institutions (Amba and Almukharreq, 2013). Therefore, the evaluation of bank performance is important for depositors, investors, managers, and regulators, and if banks are efficient, then we might expect improved profitability, greater amount of funds intermediated, better prices and service quality for consumers, and greater safety and soundness if some of the efficiency savings are applied towards improving capital buffers that absorb risk (Mohamad et al., 2008). In contrast, negative bank performance attracts the attention of investors; raising questions such as whether banks can continue operations and which banks will face hard economic conditions (AlKulaib et al., 2013). Other primary features of Islamic banks which stand as a huge difference between Islamic banks and their conventional counterparts are profit and loss sharing structure of Islamic banks, balance sheet and treatment of debt-based assets (Elsiefy, 2013). Proponents of Sharia-compliant financial services point to clear differences in business models of Islamic and conventional banks and to higher efficiency and stability of Islamic banks, rather critics argue that conventional and Islamic banks might be different in form but are similar in substance and that Islamic banks do not have any advantages in efficiency and stability (Beck et al.; 2013).

Despite the increasing debate on advantages and disadvantages of Islamic and conventional banks and the rapid growth of Islamic banks mainly in Muslim countries, rather there are relatively few empirical studies that analyze the performance of Islamic banks versus conventional ones (Mobarek and Kalonov, 2014). Jordan is no exception as a small Middle Eastern country where Islamic banks have started operating three decades ago (Ajlouni and Omari, 2013).In Jordan both conventional banking and Islamic banking operates and offer its various products and services. In light of the new opportunities as well as challenges facing Islamic banks, the objective of this paper is to assess performance of conventional and Islamic banks in Jordan using the financial ratio analysis during the period (2009-2014). Particularly, we compare efficiency of both bank-groups in terms of return on equity, return on assets, and other performance indicators derived from banks income statement and balance sheets. The article is organized as follows. Section 2 provides a brief literature review focused on measuring performance of Islamic banks in comparison with conventional banks. In sections 3 description of the methodology is provided. Data and empirical hypothesis are discussed in section 4. The results are presented in section 5 and finally, section 6 concludes.
LITERATURE REVIEW

The existing literature on analyzing Islamic versus conventional banks performance can be classified into three strides: first, studies that analyze the efficiency level using two approaches, the nonparametric frontier analysis such as Data Development Analysis (DEA) and Stochastic Frontier Analysis (SFA); second, studies testing financial stability using supervisory rating system or soundness indicators, and finally studies examining financial situation using traditional ratio analysis (Mobarek and Kalonov, 2014). Studies using frontier approaches to estimate banks financial efficiency was found in Bader (2008), Hassan et al. (2009), Grigorian and Manole (2005), Mokhtar et al. (2006), El-Gamal and Inanoglu (2005), where no significant difference in efficiency exist between Islamic and conventional banks using methods of DEA or SFA. In addition, Bader (2008) and Hassan et al. (2009) found no differences in efficiency between Islamic and conventional banks for Jordan using DEA. While Al-Muharrami (2008) found that Islamic banks are significantly more efficient than conventional banks using DEA among Gulf Cooperation Council Countries (GCC), rather Srairi (2010) and Mokhtar et al. (2007, 2008) found that Islamic banks are significantly less efficient than conventional banks using SFA and DEA in GCC countries and Malaysia respectively (Johnes et al., 2014). Abdul-Majid et al. (2010), Johnes et al. (2009) and Abdul-Majid et al. (2008, 2011a,b) found that Islamic banks have (significantly) lower efficiency than conventional banks as a consequence of modus operandi rather than managerial inadequacies. Moreover, Abdul-Majid et al. (2010) discussed that Islamic banks in Jordan have (significantly) lower efficiency than conventional banks and it is predominantly a consequence of modus operandi rather than managerial inadequacies (Johnes et al., 2014).

Said (2012), Al-Jarrah and Molyneux (2005) and Hussein (2004) compared the efficiency of Islamic and conventional banks; rather the significance of any difference is not tested. In addition, Al-Jarrah and Molyneux (2005) compared the efficiency of Islamic and conventional banks and the significance of any difference was not tested for Jordan (Johnes et al., 2014). Rosman et al. (2014) showed that the majority of Islamic banks among Middle Eastern and Asian countries (79 banks during 2007–2010) were operating inefficiently at decreasing returns to scale using DEA, and found both profitability and capitalizations were main determinants of Islamic banking efficiency. According to Beck et al. (2013), Islamic banks were found to be better capitalized, have higher asset quality and are less likely to disintermediate during crises. Chaker and Salih (2010) examined the performance of Islamic banks versus conventional banks in UAE using financial ratio methodology and found that performance of Islamic banks during the global financial crisis was better than conventional banks in terms of higher profitability ratio, liquidity ratio, and market or earnings per share ratio.

The performance of Islamic banks relative to conventional banks varied according to financial indicators employed and across the studies. Ben Khediria et al. (2015) revealed that Islamic banks are, on average, more profitable, more liquid, better capitalized, and have lower credit risk than conventional banks. For Alrawashedh et al., (2014), most of the studies on Malaysian banking system used the financial ratios analysis generally without focusing on which ratio is more significant and useful to study the differences between two types of financial institutions. Islamic banks are found to outperform conventional banks in terms of overall productivity as measured by an income-to-expenditure ratio, and profitability as measured by Return-on-Equity (ROE). Islamic banks have higher growth in equity, deposits, investment and total assets, better asset quality and capital adequacy, better credit performance, less risk due to excess liquidity and greater investment in government securities (Abdul-Majid et al., 2011).

Najjar (2013) analyzed the financial performance of conventional and Islamic banks in Bahrain using financial ratios that define profitability, financial performance, size and type of banks, and compared these banks performance in context of the global financial crisis. The analysis of ratios showed differences in financial management practices of banks and reveals wide differences in ratios used by different banks, especially before and after the financial crisis the study concluded. The analysis of ratios
for measuring financial performance shows that there is corporate excellence in asset management and value equity shares. Olson and Zoubi (2008) used 26 financial ratios to distinguish between conventional and Islamic banks among Gulf Cooperation Council (GCC) region on the basis of financial characteristics. The results show that profitability, efficiency, asset-quality indicators, and cash/liability ratios are all good discriminators between Islamic and conventional banks in the GCC region. Ajlouni (2013) and by using both approaches of Malmquist Data Envelopment analysis and financial ratio Analysis during the period (2005-2009) found that Jordanian Islamic banks are constantly efficient in terms of their inputs producing actual outputs, but still both banks did not show significance variation of performance. Samad and Hassan(2013) evaluated inter temporal and interbank performance of Bank Islam Malaysia Berhad (BIMB) in profitability, liquidity, risk and solvency and community involvement for the period (1984-1997) using financial ratios and found that (BIMB) is relatively more liquid and less risky compared to a group of 8 conventional banks. Siraj and Pillai (2012) compared performance of conventional and Islamic banks operating in GCC region during (2005-2010), based on performance indicators such as OER, NPR, ROA, ROE, EOA, operating expense, profit, assets, operating income, deposits and total equity. Inferences based on analysis revealed better performance of Islamic banking during the study period and concluded that Islamic banks are more equity financed than conventional banks, and the performance indicators were affected by the financial crises. Yudistira (2004) measured efficiency and stability of Islamic banks using Data Envelopment Analysis. The results showed that inefficiency across eighteen Islamic banks is small in comparison to many conventional counterparts and there are diseconomies of scale for small-to-medium Islamic banks that suggest mergers to be encouraged. TUREN (1996) investigated quantitatively at a micro level the claim that Islamic banking offers high performance and stability in Bahrain. The financial ratio and stock analysis indicate that Islamic Banks offers higher return and lower coefficient of variation than other commercial banks. Abu-Alkheil et al. (2013) used accounting ratio analysis to measure financial performance of European Islamic Investment Bank (EIIB) during (2005–2008). The results suggest that Islamic banks in Europe experience lower cost efficiency, higher allocative inefficiency and poor, but relatively better, technical efficiency compared to conventional banks. The efficiency and performance of Islamic Bank in comparison to two conventional banks (public and private) banks were analyzed by Akhter et al. (2011) for the financial years (2006-2010) in Pakistan using financial ratios as profitability, liquidity and credit risk. The study concluded no significant difference was observed in interest free and interest based banking in respect of profitability, while there exit divergence in liquidity and credit performance. AlKulaib et al. (2013) evaluated comparative performance of Kuwaiti Islamic banks and conventional commercial banks during and after the financial crisis of 2008 period with respect to profitability, liquidity risk, credit risk, structural ratios, risk ratios, and market ratios. Empirical results showed that Islamic banks outperformed conventional banks in terms of liquidity measured by current ratio, but no statistically significant difference in terms of profitability. Moreover, Islamic banks have significantly lower deposit liabilities to assets, loans to assets, and loans to deposit liabilities ratios. In general, conventional banks seemed to have less systematic risk than Islamic banks. The performance of Islamic and conventional banks efficiency in Malaysia was compared using financial ratios by Alrawashedh et al. (2014) and the capital ratios set was the most significant financial ratios. Assets quality ratios set has only one significant ratios. Operation ratios, profitability ratios and liquidity ratios set have same number of significant ratios where each set has two significant ratios. Widagdo and Ika (2008) investigated financial performance of Islamic banks before and after proscribing of interest using various financial ratios categorized as profitability, liquidity, risk and solvency, and efficiency. The results showed financial performance of Islamic banks before and after proscribing of interest do not show statistical difference. From the previous review, it is noted that the financial characteristics of the banking system are widely used to evaluate the performance and efficiency of the banks and various approaches have been used to determine the efficiency of banks. Therefore, with the border between
conventional and Islamic entities becoming clearer and as there are scarcity of studies concerned with Jordanian Islamic banks' performance, this paper attempts to investigate if there is any difference in performance between conventional and Islamic banking during the period (2009-2013).

DATA AND METHODOLOGY

The financial ratio method was early used in the 1970s by O'Connor (1973) and Libby (1975) and are used for all kinds of purposes such as assessment of the ability of a firm to pay its debts, evaluation of business and managerial success and even statutory regulation of a firm's performance (Barnes, 1987). Since banking firms are not equal in assets, market capital, deposits, and loans, the use of ratios removes any disparities and sets banks at par (AlKulaib et al., 2013). Therefore, financial ratio analysis compensates for bank disparities. Ratio analysis is a useful tool for business owners as it measures the health and performance of the business (whether it is a bank or a multinational corporation) in terms of profitability, asset utilization, liquidity, leverage, or market valuation to diagnose potential problems and to see how well it is doing over time (Najjar, 2013).

In this study a comparison of performance between Islamic and conventional banks for the period (2009-2013) will be studying using financial ratios such as profitability, liquidity, risk and solvency, and efficiency ratios. The sample of this study consists of data for all banks in Jordan listed in Amman Stock Exchange (ASE) and have available continuous series of accounting and financial information. The study sample consists of 16 banks, 3 Islamic banks and 13 conventional banks. Financial information from (2009-2013) is used to analyze, except for Jordan Dubai Islamic bank, the information will be used from 2010 to 2013 as it started to work in Jordan in 2010. Table 1 below shows name of banks in the study and date of establishment. The data were obtained from banks annual financial statements in order to assess banks performance. In addition, the study utilized data collected from secondary sources such as as annual reports of commercial banks in Jordan for the period of (2009-2013). It is noteworthy to mention that Islamic banks are purely performing Islamic banking and conventional banks are only workings as traditional banking. No interaction of operations between banks in Jordan until now.

Table 1: Name of Banks in the Study

<table>
<thead>
<tr>
<th>Conventional Banks</th>
<th>Date of Establishment</th>
<th>Islamic Banks</th>
<th>Date of Establishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Arab Bank</td>
<td>1948</td>
<td>1- Jordan Islamic Bank</td>
<td>1978</td>
</tr>
<tr>
<td>2- Jordan Ahli Bank</td>
<td>1955</td>
<td>2- Islamic International Arab Bank</td>
<td>1998</td>
</tr>
<tr>
<td>3- Bank of Jordan</td>
<td>1960</td>
<td>3- Jordan Dubai Islamic Bank</td>
<td>2010</td>
</tr>
<tr>
<td>4- Cairo Amman Bank</td>
<td>1960</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5- The Housing Bank For Trade and Finance</td>
<td>1973</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6- Jordan Kuwait bank</td>
<td>1976</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7- Jordan Commercial bank</td>
<td>1977</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8- Arab Jordan Investment Bank</td>
<td>1978</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9- Bank Al- Eithad</td>
<td>1978</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10- Arab Banking Corporation</td>
<td>1990</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11- Invest Bank</td>
<td>1982</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12- Capital Bank of Jordan</td>
<td>1995</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13- Societe Bank of Jordan</td>
<td>2000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This table shows bank sample in the study.

H1: There is a significant difference in profitability between Islamic banks and conventional banks in Jordan.

H2: There is a significant difference in liquidity between Islamic banks and conventional banks in Jordan.

H3: There is a significant difference in risk and solvency between Islamic banks and conventional banks in Jordan.
H4: There is a significant difference in efficiency between Islamic banks and conventional banks in Jordan.

The main research question is whether differences in performance between Islamic and conventional banks in Jordan do exist. In order to compare Islamic banks performance with conventional banks over 5 years period, the study used 12 financial ratios for banks’ performance broadly categorized into five sub groups; (1) profitability ratios, (2) liquidity ratios, (3) risk and solvency ratios and (4) efficiency ratios.

A. Profitability Ratios: Profitability measures indicate measuring managerial efficiency (Samad and Hassan, 1999) and is reflected into various indicators that include Return on Asset (ROA), Return on Equity (ROE), (Mangla and Rehman, 2010) and banks efficacy (Ajlouni and Omari, 2013) and Profit to Total Expenses (PER). Higher profitability ratios indicate better performance of the bank.

\[ \text{Return on Asset (ROA)} = \frac{\text{Profit after Tax}}{\text{Total Asset}} \]

Return on Asset (ROA) is a good and common measure of performance and profitability (Wasiuzzaman and Gunasegavan, 2013; Najjar, 2013; Mallin et al., 2014; Elsiefy, 2013; Amba and Almukharreq, 2013; AlKulaib et al., 2013; Samad and Hassan, 1999; Mangla and Rehman, 2010). The ratio is widely used as a proxy for profitability and is an important tool for indicating operational efficiency of the bank (Siraj and Pillai, 2012).

\[ \text{Return on Equity (ROE)} = \frac{\text{Profit after Tax}}{\text{Equity Capital}} \]

Return on Equity (ROE) is a primary indicator for performance and profitability of an organization (Wasiuzzaman and Gunasegavan, 2013; Siraj and Pillai, 2012), and measures earnings per dollar equity capital (Samad and Hassan, 1999).

\[ \text{Profit Expense Ratio (PER)} = \frac{\text{Profit}}{\text{Total Expense}} \]

Profit Expense Ratio (PER) measures the amount of operating profit earned for each dollar of operating expense (Moin, 2008). High PER indicates that a bank is cost efficient and makes higher profit with a given expense (Samad and Hassan, 1999).

B. Liquidity Ratios

Liquidity refers to the ability of a firm to meet its obligations in the short run, usually one year. Liquidity ratios are generally based on the relationship between current assets and current liabilities (Najjar, 2013). There are several measures of liquidity; in this study we will use the following ratios:

\[ \text{Cash Deposit Ratio (CDR)} = \frac{\text{Cash}}{\text{Deposit}} \]

Cash Deposit Ratio (CDR) is one of the liquidity measures (Ajlouni and Omari, 2013; Samad and Hassan, 1999). Cash in a bank vault is the most liquid asset of a bank. Therefore, a higher CDR indicates that a bank is relatively more liquid than a bank with lower CDR. Depositors’ trust to bank is enhanced when a bank maintains a higher cash deposit ratio (Samad and Hassan, 1999).

\[ \text{Loan Deposit Ratio (LDR)} = \frac{\text{Loan}}{\text{Deposit}} \]

Loan Deposit Ratio (LDR) is one of liquidity measures (Ajlouni and Omari, 2013; Samad and Hassan, 1999; Moin, 2008; Ansari and Rehman, 2011; Widagdo and Ika, 2008) and used to compare Islamic and conventional banks performance (Beck et al., 2013). A higher loan deposit ratio indicates that a bank takes more financial stress by making excessive loan. Therefore, lower loan deposit ratio is always favorable to higher loan deposit ratio (Samad and Hassan, 1999).

\[ \text{Current Ratio (CR)} = \frac{\text{Current Asset (CA)}}{\text{Current Liability (CL)}} \]

Current ratio is an excellent diagnostic tool, because it measures whether or not the business has enough resources to pay its bills over the next 12 months (Najjar, 2013). It is used by (Samad and Hassan (1999); Ansari and Rehman (2011); Kakakhel et al. (2013) and Widagdo and Ika, (2008) to compare liquidity between Islamic and conventional banks. It indicates how the bank management has been able to meet current liability i.e. demand deposit with current asset. A high ratio is an index that a bank has more liquid asset to pay back
the trust (deposit) of the depositors. Therefore, as withdrawals significantly exceed new deposits, banks usually recourse to replace this shortage of funds by selling securities.

\[ \text{Current Asset Ratio (CAR) = Current Asset/Total Asset} \]

Current asset ratio is calculated by having the share of current asset from total asset. High CAR indicates that a bank has more liquid asset. A lower ratio is a sign for illiquidity as more of the assets are long term in nature (Samad and Hassan, 1999; Ajlouni and Omari, 2013; Ansari and Rehman, 2011; Widagdo and Ika, 2008) used this ratio as a liquidity measure.

\[ \text{Risk and Solvency Ratios: Risk and solvency ratios are long-term solvency ratios intended to address banks’ long term ability to meet obligation or more generally its financial leverage (Ross et al. 2010). These ratios include Debt Equity Ratio (DER), Debt to Total Assets Ratio (DTAR), Equity Multiplier Ratio (EM) and Loan to Deposit Ratio (LDR).} \]

\[ \text{Debt Equity Ratio (DER) = Debt/Equity Capital} \]

Debt equity ratio is considered as risk and insolvency indicator as in (Ajlouni and Omari, 2013), (Ansari and Rehman, 2011), (Kakakhel et al. 2013) (Samad and Hassan, 1999) (Moin, 2008) as risk and insolvency indicators. Bank capital can absorb financial shock. In case asset values decrease or loans are not repaid, bank capital provides protection against those loan losses. A lower DER ratio is a good sign for a bank.

\[ \text{Debt to Total Asset Ratio (DTAR) = Debt/Total Asset} \]

Debt/Total asset indicates the financial strength of a bank to pay its debtor. It is used as a risk measure (Samad and Hassan, 1999) (Ansari and Rehman, 2011), (Kakakhel et al., 2013). A high DTAR indicates that a bank involved in more risky business.

\[ \text{Equity Multiplier (EM) = Total Assets/Share Capital} \]

The equity multiplier is a risk ratio that measures banks’ total assets relative to stockholders' equity. That is, the amount of assets per dollar of equity capital. The higher the equity multiplier, the higher the financial leverage of the bank, which means that the bank relies more on debt to finance its assets than on equity (Elsiefy, 2013). A higher EM indicates that the bank has borrowed more funds to convert into asset with the share capital; therefore, higher value of EM indicates greater risk for a bank (Samad and Hassan, 1999).

\[ \text{Loan to Deposit Ratio (LDR): It is defined as the ratio between a bank’s total loans and total deposits. The loan to deposit ratio is used to calculate lending institution's ability to cover withdrawals made by its customers.} \]

D. Efficiency Ratios

Efficiency ratios reflect the productivity of a bank in terms of how efficient and effective the banks are in managing its assets to generate the highest possible return in light of banks risk profile (Elsiefy, 2014). These ratios include the following ratios:

\[ \text{Asset Utilization Ratio (AU) = Total Revenue/Total Asset: It’s an efficiency measure on how effectively banks are well in utilizing all of its assets (Moin, 2008; Widagdo and Ika, 2008; Elsiefy, 2014).} \]

\[ \text{Income Expense Ratio (IER) = Total Income/ Total Operating Expenses: It is an efficiency measure showing the relationship between company income and total expense. The higher the income expense ratio, the higher is efficiency (Moin, 2008).} \]

\[ \text{Operating Efficiency Ratio (OE) = Total Operating Expense/Total Operating Revenue: This ratio indicates how efficiently firm uses its assets, revenues and in minimizing their expenses (Widagdo and Ika, 2008). Lower operating efficiency ratio is preferred over higher operating efficiency ratio as lower} \]
operating efficiency ratio indicates that operating expenses are lower than operating revenues (Moin, 2008).

**RESULTS**

This part presents the findings of the study which aims to compare performance of both Islamic and conventional banks. Each ratio in this study was calculated for every year for all banks, then the average of these ratios were performed to every bank among the five years as follows. Table (2) shows the average ratios of Jordanian Islamic and conventional banks for every year during the period (2009 - 2013). A total of 13 financial ratios were estimated to measure banks performance in terms of profitability, liquidity, risk and solvency, and efficiency. In this table we can see that ROA for conventional banks is higher than ROA for Islamic banks over the period of study, but for ROE Islamic banks is higher than conventional banks in 2011, 2012, 2013 respectively, but the average of ROE is higher for conventional banks. The PER conventional banks higher than Islamic banks except in 2011, Islamic banks PER in 2011 is 47.79% but 42.50% for conventional banks. The overall results report that profitability ratios for conventional banks are higher than profitability ratios for Islamic banks.

For liquidity ratios CDR, CR, CAR Islamic banks are higher than that for conventional banks during time horizon of the study, which indicates more liquid condition for Islamic banks than the conventional banks. The LDR of both sets of bank show almost similar results. Higher liquidity for Islamic banks is consistent with its lower risk as shown in table 2; DER for Islamic banks are increasing from year 2009 to 2013 but still lower than DER for conventional banks. The Islamic banks show almost similar results during the period of the study but lower than DTAR of conventional banks, and the average of Islamic banks DTAR are lower than the average of conventional banks (DTAR). Finally, average of Islamic banks EM is lower than (EM) average for conventional banks. Regarding efficiency ratios, the AU of conventional banks’ are constantly higher than Islamic banks’ AU during time horizon of the study; Islamic banks AU had increased during the year 2009 to 2013 and reached 4.13% in 2013, which indicate improving in the efficiency for Islamic bank. The average of IER for conventional banks is higher than the average of IER for Islamic banks. The highest IER for Islamic banks is 1.62 in 2011 compared to 1.59 for Islamic banks. Finally, average of Islamic banks OE is higher than the OE average of conventional banks, Islamic banks OE is higher than OE for conventional banks during the years 2009, 2010, 2012, 2013, which indicates better efficiency for conventional banks, except in 2011, the OE reached 62.76% for Islamic banks compared to 65.74% for conventional banks, that is, better efficiency for Islamic banks in that year.

**H1:** There is a significant difference in profitability between Islamic and conventional banks. To test this hypothesis; independent sample t-Test was applied to explore significant differences among profitability ratios (ROA, ROE, PER) between Islamic and conventional banks. Table (3) shows the results. Table (3) shows no statistical significant differences in profitability ratios (ROA, ROE, and PER) between Islamic and conventional banks, where “t” values do not meet the level of statistical significance of (0.05). Therefore, the first hypothesis was rejected and the alternative hypothesis is accepted to read as follows: "There are no significant differences in profitability between Islamic and conventional banks". This result is consistent with Samad and Hassan (1999), Ansari and Rehman, (2011), Abu Loghod (2010), Widagdo and Ika (2008), Samad (2004), and Kader, et al. (2007). Profitability of banks is calculated by using three profitability measures ROA, ROE, and PER, therefore the higher the profitability ratios, the better are the performance of the bank. The results show that the mean of ROA, ROE and PER for conventional banks mean of ROA, ROE and PER are slightly higher than Islamic banks during (2009-2013). However, the difference is not statistically significant at 0.05 significance level. Hence, H1 is rejected and states that there is no significant difference in profitability between Islamic and conventional banks.
This table shows sample t-test for profitability ratios between Islamic and conventional banks.

<table>
<thead>
<tr>
<th>Profitability Ratios</th>
<th>Bank Type</th>
<th>Num</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>&quot;t&quot; value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return on Asset (ROA)</td>
<td>Conventional</td>
<td>13</td>
<td>1.25%</td>
<td>0.004</td>
<td>1.762</td>
<td>0.100</td>
</tr>
<tr>
<td></td>
<td>Islamic</td>
<td>3</td>
<td>0.74%</td>
<td>0.005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return on Equity (ROE)</td>
<td>Conventional</td>
<td>13</td>
<td>8.91%</td>
<td>0.034</td>
<td>1.400</td>
<td>0.891</td>
</tr>
<tr>
<td></td>
<td>Islamic</td>
<td>3</td>
<td>8.54%</td>
<td>0.073</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profit to Total Expenses (PER)</td>
<td>Conventional</td>
<td>13</td>
<td>51.70%</td>
<td>0.188</td>
<td>1.150</td>
<td>0.269</td>
</tr>
<tr>
<td></td>
<td>Islamic</td>
<td>3</td>
<td>36.50%</td>
<td>0.294</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**This table shows sample t-test for profitability ratios. ** indicates significance at 5 percent level for difference in means.**

H2: There is a significant difference in liquidity between Islamic and conventional banks.

To test this hypothesis, independent sample t-Test was applied to explore significant differences in liquidity ratios (CDR, LDR, CR, CAR) between Islamic and conventional banks as shown in table (4). Table (4) shows that there are statistical significant differences in liquidity ratios (cash deposit ratios, current ratio and current assets ratio) between Islamic and conventional banks, where "t" values reach to the level of statistical significance (0.05). Therefore, the second hypothesis was accepted. This result is consistent with Ansari and Rehman (2011), Samad and Hassan (1999), Al-Mamun et al., (2014). There are statistical significant differences in cash deposit ratios (CDR), where t. value reached (3.741) by statistically significant (0.002), in favour of Islamic banks (mean 51%), but conventional (32%). There are statistical significant differences in current ratio (CR) where t. value reached (11.540) by statistically significant level (0.00) in favour of Islamic banks (mean 1.20), but (0.032) for conventional banks. There
are statistical significant differences in current assets ratio (CAR), where t. value reached (3.647) by statistically significant level (0.003) in favour of Islamic banks (mean 41%), but conventional (24%).

Table 4: Result of Independent Sample T-test for Differences in Liquidity Ratios between Islamic and Conventional Banks

<table>
<thead>
<tr>
<th>Liquidity Ratios</th>
<th>Bank Type</th>
<th>Num</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>&quot;T&quot; Value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash Deposit Ratio (CDR)</td>
<td>Conventional</td>
<td>13</td>
<td>32%</td>
<td>0.06</td>
<td>-3.741</td>
<td>0.002**</td>
</tr>
<tr>
<td></td>
<td>Islamic</td>
<td>3</td>
<td>51%</td>
<td>0.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loan Deposit Ratio (LDR)</td>
<td>Conventional</td>
<td>13</td>
<td>62%</td>
<td>0.08</td>
<td>-0.446</td>
<td>0.662</td>
</tr>
<tr>
<td></td>
<td>Islamic</td>
<td>3</td>
<td>66%</td>
<td>0.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Ratio (CR)</td>
<td>Conventional</td>
<td>13</td>
<td>0.32</td>
<td>0.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Islamic</td>
<td>3</td>
<td>1.20</td>
<td>0.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Assets Ratio (CAR)</td>
<td>Conventional</td>
<td>13</td>
<td>24%</td>
<td>0.04</td>
<td>-11.540</td>
<td>0.000**</td>
</tr>
<tr>
<td></td>
<td>Islamic</td>
<td>3</td>
<td>41%</td>
<td>0.17</td>
<td>-3.647</td>
<td>0.003**</td>
</tr>
</tbody>
</table>

This table shows sample independent t test for liquidity ratios. ** indicates significance at 5 percent level for difference in means.

There are no statistical significant differences in loan deposit ratio (LDR) between Islamic and conventional banks, where "t" values did not reach to the level of statistical significance (0.05). The LDR of Islamic banks is lower than conventional banks’ during 2009 and 2010. The LDR of Islamic banks is the same as LDR for conventional banks in 2011, but LDR of Islamic banks is higher than conventional bank’s LDR during 2012 and 2013, the reason is lower amount of deposits for a new Islamic bank as Jordan Dubai Islamic Bank.

H3: There is a significant difference in risk and solvency between Islamic and conventional banks.

To test this hypothesis, independent sample t-test was applied to explore significant differences in risk insolvency ratios (DER, DTAR, EM, LDR) between Islamic and conventional banks as shown in table (5). Table (5) shows that there are statistical significant differences in risk solvency ratios (DER, DTAR, EM) between Islamic and conventional banks, where "t" values reached a level of statistical significance of (0.05). Average DER, DTAR and EM for Islamic banks are (2.98%), (30.24%), (1.45%) as compared to (6.19%), (85.37%), (7.21%) for their conventional counterparts respectively. This indicates that Islamic banks are less risky than conventional bank, which is consistent with Samad and Hassan (1999), Al-Mamun et al., (2014) and Moin (2008). There are no statistical significant differences in loan deposit ratio between Islamic and conventional banks, where "t" values did not reach the level of statistical significance (0.05), and this is consistent with Moin (2008) and Pual et al., (2013).

Table 5: Independent Sample T-test for Differences of Risk and Solvency Ratios Between Islamic and Conventional Banks

<table>
<thead>
<tr>
<th>Risk and Solvency Ratios</th>
<th>Bank Type</th>
<th>Num</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>&quot;T&quot; Value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt Equity Ratio (DER)</td>
<td>Conventional</td>
<td>13</td>
<td>6.19%</td>
<td>1.30</td>
<td>3.529</td>
<td>0.003**</td>
</tr>
<tr>
<td></td>
<td>Islamic</td>
<td>3</td>
<td>2.98%</td>
<td>1.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Debt to Total Assets Ratio (DTAR)</td>
<td>Conventional</td>
<td>13</td>
<td>85.37%</td>
<td>0.02</td>
<td>21.148</td>
<td>0.000**</td>
</tr>
<tr>
<td></td>
<td>Islamic</td>
<td>3</td>
<td>30.24%</td>
<td>0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equity Multiplier (EM)</td>
<td>Conventional</td>
<td>13</td>
<td>7.21</td>
<td>1.29</td>
<td>7.490</td>
<td>0.000**</td>
</tr>
<tr>
<td></td>
<td>Islamic</td>
<td>3</td>
<td>1.45</td>
<td>0.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loan Deposit Ratio (LDR)</td>
<td>Conventional</td>
<td>13</td>
<td>62%</td>
<td>0.08</td>
<td>-0.446</td>
<td>0.662</td>
</tr>
<tr>
<td></td>
<td>Islamic</td>
<td>3</td>
<td>66%</td>
<td>0.29</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This table shows sample independent t test for risk and solvency ratios. ** indicates significance at 5 percent level for difference in means.
H4: There is a significant difference in efficiency between Islamic and conventional banks. To test this hypothesis, independent sample t-test was applied to explore significant differences in efficiency ratios (AU, IER and OE) between Islamic and conventional banks as in table (6).

Table (6) shows that there are statistical significant differences in (AU), where t- value reached (2.283) by statistically significant rate of (0.039), in favour of conventional banks (mean 4.37%), but (3.40%) for Islamic banks. These results are consistent with Moin (2008). Moreover, there are no statistical significant differences in efficiency ratios IER and OE between Islamic and conventional banks, where "t" values did not reach the level of statistical significance (0.05); but the mean of IER equal (1.73%) for conventional banks is higher than the mean of (IER) for Islamic banks. The higher the ratio, the higher efficiency are conventional banks .In the other side the mean of OE for conventional banks is lower than the mean of OE for Islamic banks, which reflects better efficiency for conventional banks , which is in coherence with Kakakhel et al. (2013) and Moin (2008). Conventional banks in Jordan have a very long history and great experience which lead to better performance.

Table 6: Independent Sample T-test for Differences of Efficiency Measures between Islamic and Conventional Banks

<table>
<thead>
<tr>
<th>Efficiency Ratios</th>
<th>Bank Type</th>
<th>Num</th>
<th>Mean</th>
<th>Standard. Deviation</th>
<th>&quot;T&quot; Value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset Utilization Ratio (AU)</td>
<td>Conventional</td>
<td>13</td>
<td>4.37%</td>
<td>0.69</td>
<td>2.283</td>
<td>0.039**</td>
</tr>
<tr>
<td></td>
<td>Islamic</td>
<td>3</td>
<td>3.40%</td>
<td>0.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income Expense Ratio (IER)</td>
<td>Conventional</td>
<td>13</td>
<td>1.73</td>
<td>0.258</td>
<td>0.830</td>
<td>0.421</td>
</tr>
<tr>
<td></td>
<td>Islamic</td>
<td>3</td>
<td>1.47</td>
<td>0.401</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating Efficiency (OE)</td>
<td>Conventional</td>
<td>13</td>
<td>61.53%</td>
<td>9.69</td>
<td>-1.628</td>
<td>0.126</td>
</tr>
<tr>
<td></td>
<td>Islamic</td>
<td>3</td>
<td>76.58%</td>
<td>29.89</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This table shows sample independent t test for efficiency measures. ** indicates significance at 5 percent level for difference in means.

CONCLUDING COMMENTS

The purpose of this study is to compare financial performance of Islamic and conventional banks in Jordan over the period (2009-2013) using Financial Ratio Analysis. The study sample consists of 16 banks, 3 Islamic banks and 13 conventional banks. A comparative study is undertaken based on performance indicators, 13 financial ratios were estimated to measure performances in terms of profitability, liquidity, risk and solvency, and efficiency. T-test is used in determining their significance. The study concluded differences in financial performances between conventional and Islamic banks.

The results show that over the five years of study, profitability measures of performance did not show statistically significant differences between Islamic and conventional banks. Therefore, the first hypothesis was rejected. For liquidity ratios, there are statistical significant differences in CDR, CR, and CAR which indicate higher liquidity for Islamic banks and this is an expected result for Islamic banks, as Islamic banks have limited investment opportunities resulted from the prohibition of interest. In addition, Islamic banks cannot rely on borrowing money from central bank when money is needed because of interest prohibition. Islamic banks are found to be more liquid than conventional bank, which is consistent with the general literature view that Islamic banks suffer from liquidity excess.

For risk and solvency ratios as in DER, DTAR and EM, they showed a statistically significant difference between Islamic and conventional banks. That means Islamic banks are less risky and more solvent than conventional banks, which reflect a strong financial strength of Islamic banks to pay their debtors. Moreover, there are no significant differences between both banking types in LDR. According to efficiency ratios the result shows statistical significant differences in AU ratio between Islamic and conventional banks, which reflect better efficiency for conventional banks, whereas no statistical significant differences in efficiency ratios (IER, OE) between Islamic and conventional banks, but the
(IER) mean for conventional banks is higher than (IER) mean for Islamic banks, which reflect higher efficiency for conventional banks. The OE mean for conventional banks is lower than OE mean for Islamic banks, which also reflect better efficiency for conventional banks. This is because conventional banks in Jordan have long history and experience in the banking sector, as the Jordan Islamic bank that has been working for long period (since 1978) as an Islamic bank, whereas other Islamic banks are new. In contrast conventional banks in Jordan have longer history and experience and larger share in the Jordanian banking sector, so the sample of the study have more conventional banks than Islamic banks. Eventually, this imposes limitations in generating more accurate evaluation of performance comparison.

In the end, the absence of Lender of last resort facility and of short-term investments that is interest free resulted in excess liquidity requirement for Islamic bank. Jordanian Islamic banks should increase its ability to use its excess money to generate returns, and make balance between liquidity and profitability. Therefore, the Central bank of Jordan also should help Islamic banks to invest its excess liquidity. Finally, the number of Islamic banks in Jordan should be increased and their efficiency should be improved to be able to compete in the banking industry.

REFERENCES


BIOGRAPHY

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RESEARCH CENTER INTELLECTUAL CAPITAL AND TECHNOLOGY INNOVATION: TRANSFERRING KNOWLEDGE TO UNIVERSITIES AND INDUSTRY

Eyran Roberto Díaz Gurrola, University Technological of Torreon
Norma Maricela Ramos Salinas, University Autonomous of Querétaro
Ramón Heredia Martínez, University Technological of Torreon

ABSTRACT

Innovation management allows companies to be more competitive and positioned at the forefront of products and services offered, thereby providing greater income and development in organizations. The main objective of this research is to identify factors that stimulate, intellectual capital and innovation in research centers, and the transfer of knowledge to the productive sector and universities. Some 51 surveys were applied to five centers of public research. We conclude that innovation management is the result of interaction between organizational culture, leadership, the company's vision, the commitment of each member of the Organization and others. These elements can not act separately, they must be in sync with the market, technology as well as current and future needs of the client.

JEL: I12, M00

KEYWORD: Technological Innovation, Intellectual Capital, Bonding

INTRODUCTION

The management of intellectual capital and innovation management is key to confront the technological challenges. The present investigates factors that stimulate the intellectual capital and innovation in universities, research centers and the transfer of knowledge to the productive sector. The main objective is to identify factors that stimulate, intellectual capital and innovation in research centers, and how to manage the transfer of knowledge to the productive sector and universities. Specific objectives are: 1. To identify which variables influence the organization to foster intellectual capital. 2. To identify the variables that influence the organization to foster innovation. 3. To identify variables that influence the organization to encourage the transfer of knowledge to universities and 4. To identify variables that influence the organization to encourage the transfer of knowledge to companies.

CONACYT contributed 3,930 million pesos, during 2014 through the program of incentives to innovation to encourage investment in innovations that would be turned into business opportunities. From January to July of 2014, 100% of that budget was channeled, from which 3,673 million pesos to support companies that were linked with universities and public research centers. In the first six months of 2014, 872 projects were supported, from 32 different federal entities. Some 646 of the projects were given to SMEs, focused mainly to industrial branches of chemistry, transport, food, machinery and equipment, plastic and rubber. (second review of Government 2014 p. 264) (Source: second report of Government Presidency of Mexico).

The contribution of this paper is to explore the variables in centers of research and development, which are part of the (CONACYT), National Council for Science and Technology. Most available studies focus on the analysis from the SMEs (Small and Medium-Size enterprises) point of view. This research is made up
of the following sections. The literature review identifies the state of the art, and evaluate various points of view on the subject, focusing on models of intellectual capital and innovation. The methodology steps were: the identification of variables, the sample was established, and the implementation of surveys for its interpretation. Finally the results are presented and the conclusion section closes the paper.

LITERATURE REVIEW

This section summarizes the existing literature. Doing so allows us to know the State of the art, and to evaluate and compare various points of view on the subject. These points of view focus on models of intellectual capital and innovation.

Manual of Frascati (2002) notes that technological innovation activities are a set of scientific, technological, organizational, financial and commercial stages, including the investments in new knowledge to generate new improvements of new processes and products. I + D is nothing more than one of the activities. The activities can be carried out at different stages of the process of innovation. They are used not only as a source of creative ideas, but also to solve the problems that may arise at any stage until its completion. On the other hand Nonaka and Takeuchi (1995) established that innovation is a continuous process of learning whereby companies create new technological knowledge. Likewise Drucker (2005) defines innovation as the organized and systematic search to change the opportunities that exist in the environment. Peter Drucker, says that innovation and the innovative entrepreneur raises five basic sources for innovation; 1. The unexpected: to surprise, 2. The illogical: the difference between what is and what should be. 3. The need to improve an existing process. 4. The breakdown of an industrial structure or demographic changes in the market and 5. The perception changes in form and meaning.

On the other hand, López M and Vázquez (2007) argue that innovation is a process that generates new knowledge and generates new technologies that can be applied to products, production and management processes. Technology is defined as a set of susceptible industrial techniques to be applied to a production process. According to the Oslo Manual, (2005) 3rd Edition we describe the concepts of innovation and its types. Innovation is the introduction of a new, or significantly improved product (good or service), a new method of marketing or a new organizational method, internal business practices, the Organization of the workplace or foreign relations. Innovation is the main driver of growth and the creation of wealth, the increase in competitiveness, greater participation in global markets and production networks, improvements in the quality of life of citizens and to face global challenges. The Oslo Manual is a guide for carrying out measurements and studies of scientific and technological activities that define concepts and clarifies the activities considered as innovative. Table 1 contains the definition of models of intellectual capital and innovation models.

Tabla 1: Modelos Principales de Capital Intelectual, Innovación Dimensiones y Definiciones

<table>
<thead>
<tr>
<th>Panel A: Models of Intellectual Capital</th>
<th>Autores</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thomas Stewart, 1991)</td>
<td>&quot;Intellectual Capital is anything that can not be touched but it can do to earn money to the company.&quot;</td>
<td></td>
</tr>
<tr>
<td>Jonson 1996</td>
<td>Intellectual Capital is hidden inside a book, traditional concept called Goodwill. The difference is that traditionally the Goodwill stresses common but little real assets such as brands of the factories. In comparison the Intellectual Capital seeks still less tangible assets, such as the ability of a company to learn and adapt&quot;.</td>
<td></td>
</tr>
<tr>
<td>Annie Brooking 1996</td>
<td>&quot;The term intellectual Capital refers to the combination of intangible assets that allow you to run the company&quot;.</td>
<td></td>
</tr>
<tr>
<td>Leif Edvinsson Sullivan 1996</td>
<td>&quot;Intellectual Capital is the knowledge that can be converted into profit in the future and that is formed for resources such as ideas, inventions, technologies, software, designs and processes.&quot;</td>
<td></td>
</tr>
<tr>
<td>Leif Edvinsson Michael Malone 1997</td>
<td>&quot;The possession of knowledge, applied experience, organizational technology, relationships with customers and professional skills that provide a competitive advantage in the market&quot;.</td>
<td></td>
</tr>
</tbody>
</table>
Panel B: Models of Innovation

<table>
<thead>
<tr>
<th>Authors</th>
<th>Dimensions</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Booz, Allen y Hamilton (1982)</td>
<td>Novelty for the company vs. New to the market.</td>
<td>&quot;New to the world&quot; products (new-to-the-world): products that create new categories. New lines of products: products that are not new to the market, but are for the company. Extension of ranges: new products that are included in existing product lines. Improvements of existing products: strengthening of the realizations of a product and an improvement of its image. New positioning: new applications of existing products. Cost reductions: products which, in equal quality, are less expensive than existing products.</td>
</tr>
<tr>
<td>Chandy y Tellis (1998)</td>
<td></td>
<td>Incremental innovations: weak technological content and weak modification of benefits for the consumer. Technological break: using innovative technology without major changes to the level of benefits. Break for the market: substantial increase in benefits with the use of existing technology. Radical innovation: use of an innovative technology with an increase</td>
</tr>
<tr>
<td>Garcia y Calantone (2002)</td>
<td>Two discontinuities, technological vs. for the market) by macro vs. micro perspectives</td>
<td>Radical innovations: break on the four dimensions (two discontinuities by two economic prospects). Completely new innovations: discontinuity at the macroeconomic level. Incremental innovations: changes to the level of activity of the enterprise or consumer practices.</td>
</tr>
<tr>
<td>Miller y Miller (2012)</td>
<td>This classification largely has been used by the ARI team at the University of Toledo.</td>
<td>Disruptive innovations: innovations in sustainability, which can be one or the other (for example, transformational), but not necessarily disruptive continuous. Architectural innovation: existing technologies with new modes. Radical innovation: the creation of new technologies that make new things possible. Incremental innovation: making improvements to existing technologies. Modular innovation: the creation of new technologies to solve existing problems.</td>
</tr>
</tbody>
</table>

Source: development Dra. Norma Maricela Ramos Salinas. *Management of technological innovations and their overcrowding* article 2014 authors Ramos N. M Urbiola A. E y Gonzalez E. This table explains the different approaches to the development of innovation adapted from Ziamou (1999); Garcia y Calantone (2002); Miller y Miller (2012).
Martínez L. (2011) in his book "Training for Innovation" carried out an analysis of the contributions of A. Schumpeter (1885-1950) in his "theory of economic development." This theory remains current, despite the fact that it has been more than 100 years since their contributions. The theory of economic development, has been summarized with the term 'Innovation', due to its emergence from the economic analysis and considered the economic life changes. The Nobel Prize in Economy of Robert Solow designates "innovation as the main source of employment and productivity. "The new revolution of knowledge platform are education and the peak is the same innovation that arises from the combination of art, science and technology" (Muñoz, R, 2014 p. 35). Ordoñez defines creativity "as the ability to think about new solutions to an existent problem ". Creativity can observed as leaps that brings us to imaginary proceedings, and thus overcome the barrier that the problem represents. Creativity occurs when an idea coincides and has a positive effect. (Ordonez, r., 2011, p. 88).

Innovation was synonymous with technological innovation, and the responsibility of innovating resides mainly in the I + D departments and engineers according to studies conducted by IBM. The Global CEO Study based on 765 interviews with CEOs and business leaders. To a large extent, the most significant sources of ideas comes from employees, customers, and partners. Other sources of ideas are consultants, the competition, trade shows, e-Sales Department Conference, and I+D of the firm. Finally universities and academies, and in many cases sometimes provide ideas. Innovation does not always require new technologies. But, to take advantage of important technologies, 3M company has 18 technologies and have managed to generate more than 2000 products. When the company is limited to addressing innovation detached from technology or it’s I+D Department, it is missing the creative potential of their workers. (Philip K; Trias, f. 2011 p. 20-21)

How to Create Knowledge

To understand innovation, a new theory of organizational knowledge creation is needed. In this new theory, the key to creation of knowledge is the mobilization and conversion of tactical knowledge to a explicit one. To do this, it is necessary to pass through four stages: socialization, externalization, combination and internalization. These stages constitute the engine of the knowledge creation process, since they are the stages that individuals experiment in such a way that individual knowledge is shared and transferred through the organization. Knowledge, unlike information, is of beliefs and commitments. It is a position, perspective, or particular intention of knowledge. Action is for the generation of organizational knowledge. Creation theory takes from the traditional definition of knowledge that is considered a "justified true belief". (Nonaka, f.; Takeuchi. H. 1990, p. 64).

A change of paradigm must be emphasized. This change gives insight to the firm and gives the client decision power. Another paradigm that must change is in universities. By creating more laboratory incubators and promoting entrepreneurship, innovative is where you stimulate critical thinking, collaborative problem-solving, decision-making, teamwork and innovation (Muñoz, R 2014. p48-49 p.). What is innovation? Innovation distinguishes both a process and result. As a process it is characterized by, "a transformation of the industrial processes execution to design, to make and distribute products and services. As a result, it designs the product (object or service) that is introduced in the market." It is in these ways we look at innovation. Although, the authors used different terminologies, in the vast majority of classifications of innovations (Table 1) it is agreed they need to be new from the point of view of the company, from the point of view of the consumer, or both. On the other hand, it highlights the fact that there is not an emphasis on groups and practices of consumption or a distinction by consumer groups and geographic regions. Table 2 shows the dimensions and definitions of innovation models.
Research Centers in México

CONACYT (2014) was created by order of the H. Union Congress on December 29, 1970, as a public decentralized body of the Federal public administration. It is a member of the education sector, with a legal personality and with its own patrimony. It is also responsible for drawing up science and technology policies in Mexico. From its creation until 1999 two reforms were presented and a law to coordinate and promote scientific and technological development was enacted June 5, 2002. The goal is to consolidate the national science and technology systems to respond to priority demands in the country, giving solution to problems and specific needs, and to contribute to raising the standard of living and welfare of the population. This requires: 1. To have a State policy on the subject. 2. To increase the scientific and technological capacity of the country. 3. To raise the quality, competitiveness and innovation of enterprises. Their mission for the 2025-year is to promote and strengthen scientific development and technological modernization of Mexico, through the training of high level human resources, the promotion and support of specific research projects and the dissemination of scientific and technological information. Source (CONACYT, 2014).

The CONACYT (2014) centers’ system is a set of twenty-seven research institutions. According to its objectives and specialties, they are grouped into three main areas: ten of them in Natural Sciences, Social sciences and Humanities, eight are more specialized in development and technological innovation, and another one in the financing of postgraduate studies. The target in accordance with the programme of science and technology 2001-2006, issued guidelines objectives of the CONACYT public centers that are: 1. Disseminating science and technology in society. 2. To promote local technology and to implement it. 3. To promote local technology and to adapt it to foreign technologies. 4. To innovate in the generation, development, assimilation and application of science and technology knowledge. 5. To link science and technology in society and the productive sector to address problems. 6. To create and to develop mechanisms and incentives that promote contributions of the private sector in the scientific and technological development. 7. To incorporate students in scientific and technological activities to strengthen their academic formation. 8. To boost the institutional capacity for scientific, humanistic, and technological research. 9 To foster and promote the scientific, humanistic and technological culture of Mexican society. Source: (2014 CONACYT).

DATA AND METHODOLOGY

The research problem addressed here important because management of intellectual capital and innovation allows us to be more competitive, and to position ourselves at the forefront of products and services that are offered thereby giving us greater income and development. We investigate these issues to determine the variables and indicators that allow us to develop the management of intellectual and innovation capital in the public research center and subsequently so that they are established as a culture in the company. The present research carried out a case study, using the quantitative methods where the phenomenology seeks to discover, describe and interpret how individuals or actors perceive the social world according to their experience (Hernández R experience; Fernandez, C. & Baptista p. 2006). A total of 51 surveys were conducted in five research centers. Surveys were applied to employees who have links with universities, companies, and that have participated in the past with innovation funds of CONACYT or any other federal or State Government that promotes the transfer of knowledge through bonding which significantly reduces sample.

An instrument with a total of 31 variables was used. Variables examine the brainpower, innovation, enterprises and universities. These variables are analyzed using the experts method, a technique that is defined as a method of structuring a process of communication group which is effective in allowing a group of individuals as a whole, and treat it as a complex problem (Linstone, Turoff, and Helmer, (1975). The survey was applied directly in four research centers over a period of 3 months. The survey was sent by email. An average 9 surveys were administered in each center. The selected subjects were staff with experience in participation in calls which link to research centers universities and the productive sector.
preferably of CONACYT funds. Once the data was obtained, the following tests were performed: a) To test the Anderson normality test - Darling was completed with the Minitab package. SPSS 15.0 was used for the Kruskal-Wallis test which is a non-parametric method to test whether a group of data comes from the same population. A regression analysis was performed between a dependent variable, and the independent variables \( X_i \) and a random term \( \varepsilon \) as follows: \( Y = aX + b \).

RESULTS

The first hypotheses is as follows: H1 The centers of public research stimulate innovation and intellectual capital required to strengthen the following organizational variables: 1.1 The working environment. 1.2 relevance, 1.3 satisfaction of belonging to the organization, 1.4 Creativity fostering, 1.5 Adequate training and 1.6 innovative leadership. Table 2 presents descriptive statistics of the variables for our first hypothesis.

Table 2: Checking the H1 by Two Methods Kruskal-Wallis Test H1 and Regression Analysis

<table>
<thead>
<tr>
<th>Variables</th>
<th>1.6</th>
<th>1.2</th>
<th>1.5</th>
<th>1.4</th>
<th>1.7</th>
<th>1.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>df</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Asymp.Sig.</td>
<td>0.0490</td>
<td>0.0090</td>
<td>0.0030</td>
<td>0.0020</td>
<td>0.0880</td>
<td>0.0020</td>
</tr>
</tbody>
</table>

Test Statistic of Regression Analysis, \( R = 0.7120 \) Dependent Variable 1.3

| Unstandardized Coefficients B | -0.1790 | 0.4430 | 0.2390 | 0.2250 | 0.139 | 0.1420 |
| Standardized Coefficients Beta | -0.1600 | 0.3750 | 0.2730 | 0.1410 | 0.2180 | 0.1320 |
| t | -1.058 | 2.875 | 2.010 | 1.544 | 1.019 | 0.896 |
| Sig. | 0.2960 | 0.0060 | 0.0510 | 0.1300 | 0.3140 | 0.3750 |
| Variables Accepted | 1.2 | 1.5 |

Table 2 describes the values of variables obtained by the two methods taken as acceptance criteria in the regression analysis. S is lower than 6% and Kruskal-Wallis test the value of GIS. Being less than 5% are the variables that most impact the results for being significant with the 1.2 variable of relevance and 1.5 of adequate training.

The second hypothesis H2 is formulated as: stimulate the staff for the development of the intellectual capital required to strengthen the following technical variables: 2.1 Basic research 2.2 Applied Research. 2.3 Technological development 2.4 State of the art. 2.5 Technology forecasting 2.8 Feasibility studies 2.9 Realization of reverse engineering and 2.10 Intellectual Property Management. Table 3 presents descriptive statistics of the variables from the second hypothesis.

Table 3: Test results of H2 by Kruskal-Wallis and Regression Analysis

<table>
<thead>
<tr>
<th>Test Statistic of Kruskal-Wallis H2</th>
<th>2.1</th>
<th>2.4</th>
<th>2.8</th>
<th>2.9</th>
<th>2.10</th>
<th>2.3</th>
<th>2.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>2.005</td>
<td>4.789</td>
<td>3.624</td>
<td>6.337</td>
<td>6.990</td>
<td>10.093</td>
<td>5.644</td>
</tr>
<tr>
<td>df</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Asymp.Sig.</td>
<td>0.5710</td>
<td>0.1880</td>
<td>0.3050</td>
<td>0.0960</td>
<td>0.0720</td>
<td>0.0180</td>
<td>0.1300</td>
</tr>
</tbody>
</table>

Test Statistic of Regression Analysis, \( R = 0.589 \) Dependent Variable 2.5

| Unstandardized Coefficients B | -0.0510 | 0.2160 | -0.2580 | -0.1970 | 0.3020 | 0.3920 | 0.940 |
| Standardized Coefficients Beta | -0.0570 | 0.2110 | 0.2140 | 0.1930 | 0.3140 | 0.2930 | 0.0850 |
| t | -0.4020 | 1.500 | -1.510 | -1.357 | 2.123 | 2.159 | 0.5410 |
| Sig. | 0.689 | 0.1410 | 0.1380 | 0.1820 | 0.0400 | 0.0360 | 0.5910 |
| Variables Accepted | 2.10 | 2.3 |

Table 3 describes the values of the variables by two methods taken as an acceptance criterion in the error tip regression analysis. S is lower than 6% and the value of GIS Kruskal-Wallis test. Asintot. Being less than 5% of the variables that most impact the result to be significant are 2.10 Intellectual Property Management 2.3 Technological Development.
The third hypothesis, H3 posits that research public centers encourage staff to develop innovation required to strengthen the following technical variables: 2.6 Patent Search, 2.7 Writing patents and claims 2.11 Link between universities 2.12 Link with the industrial sector. Table 4 presents descriptive statistics related to the variables of our third hypothesis.

### Table 4: Results of Tests on Strengthening Technical Variables

<table>
<thead>
<tr>
<th>Test of Kruskal-Wallis H3</th>
<th>Variables</th>
<th>2.12</th>
<th>2.6</th>
<th>2.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>7.361</td>
<td>10.651</td>
<td>10.654</td>
<td></td>
</tr>
<tr>
<td>df</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Asymp.Sig.</td>
<td>0.118</td>
<td>0.031</td>
<td>0.031</td>
<td></td>
</tr>
</tbody>
</table>

### Test of Regression Analysis, R=0.516, Independent variable 2.11

| Unstandardized Coefficients B | 0.277 | 0.246 | 0.175 |
| Unstandardized Coefficients std. Error | 0.158 | 0.133 | 0.125 |
| Standardized Coefficients Beta | 0.226 | 0.272 | 0.213 |
| t                           | 1.476 | 1.846 | 1.4 |
| Sig.                        | 0.087 | 0.071 | 0.168 |
| Accepted Variables          | 2.6   |      |     |

Table 4 describes values of the variables obtained by two methods that were acceptance criteria in the regression analysis. S is lower than 6% and Kruskal-Wallis test the value of GIS. Asintot. Less than 5% is the variable that most impact the result being significant is 2.6 patent search.

The fourth hypothesis, H4 posits that: in order for the centers of public research to achieve the knowledge transfer to stimulate universities requires strengthening the following technical variables: 3.1 Technical competence divergent objectives. 3.3 Cultural Barriers. 3.4 Problems related to intellectual property rights. 3.6 Coordination difficulties. 3.8 problems related to confidentiality. 3.11 Problems related to intellectual property rights 3.12 Problems of responsibilities attribution. Table 5 presents the descriptive statistics carried out to the variables from the fourth hypothesis.

### Table 5: Results of University Stimulation Variables

<table>
<thead>
<tr>
<th>Test of Kruskal-Wallis H4</th>
<th>Variables</th>
<th>3.4</th>
<th>3.8</th>
<th>3.1</th>
<th>3.6</th>
<th>3.12</th>
<th>3.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>12.648</td>
<td>13.822</td>
<td>1.41</td>
<td>14.969</td>
<td>8.835</td>
<td>1.145</td>
<td></td>
</tr>
<tr>
<td>df</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Asymp.Sig.</td>
<td>0.005</td>
<td>0.003</td>
<td>0.703</td>
<td>0.002</td>
<td>0.032</td>
<td>0.766</td>
<td></td>
</tr>
</tbody>
</table>

### Test of Regression Analysis, R=0.731, Dependent Variable 3.11

| Unstandardized Coefficients B | 0.2270 | 0.1630 | -0.0730 | 0.3310 | 0.2330 | 0.0560 |
| Unstandardized Coefficients std. Error | 0.1050 | 0.1060 | 0.1010 | 0.1040 | 0.1120 | 0.0960 |
| Standardized Coefficients Beta | 0.3050 | 0.1840 | -0.0810 | 0.3550 | 0.2400 | 0.0660 |
| t                           | 2.6350 | 1.5360 | -0.7260 | 3.1790 | 2.0910 | 0.5810 |
| Sig.                        | 0.0120 | 0.1320 | 0.4720 | 0.0030 | 0.0420 | 0.5640 |
| Variables Accepted          | 3.4    | 3.6   | 3.12  |      |      |      |

This table describes values of the variables obtained by the two methods that were used as acceptance criteria in the error tip regression analysis. S is lower than 6%, and the Kruskal-Wallis test the value of GIS. Being less than 5% is the variable that most impact the result to be significant is 2.6. Patent search.

The fifth hypothesis is: centers of public research to achieve the transfer of knowledge in companies require strengthening the following technical variables: 3.5 cultural barriers, 3.7 coordination difficulties, 3.9 problems relating to confidentiality, 3.10 problems relating to property rights, 3.12 problems of attribution of responsibilities Table 7 presents descriptive statistics to the variables of our fifth hypothesis.
Table 6: Results of Company Transfer Variables

<table>
<thead>
<tr>
<th>Test statistic of Kruskal-Wallis H5 Variables</th>
<th>3.5</th>
<th>3.7</th>
<th>3.1</th>
<th>3.12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>9.624</td>
<td>15.373</td>
<td>12.468</td>
<td>13.487</td>
</tr>
<tr>
<td>df</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Asymp.Sig.</td>
<td>0.022</td>
<td>0.002</td>
<td>0.006</td>
<td>0.004</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test Statistic of Regression analysis, R=0.692, Dependent Variable 3.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unstandardized Coefficients B</td>
</tr>
<tr>
<td>Unstandardized Coefficients std. Error</td>
</tr>
<tr>
<td>Standardized Coefficients Beta</td>
</tr>
<tr>
<td>t</td>
</tr>
<tr>
<td>Sig.</td>
</tr>
<tr>
<td>Variables Accepted</td>
</tr>
</tbody>
</table>

Table 6 describes values of variables obtained by two methods that were taken as acceptance criteria in the error tip regression analysis. S is lower than 6% and the value of GIS Kruskal-Wallis test. Asintot. Being less than 5% variables that most impact the result to be significant are 3.7 and 3.1 coordination difficulties the technical competence.

CONCLUDING COMMENTS

The main objective of this research was identification of factors that stimulate, the intellectual and innovation capital in research centers. We also wish to identify the way to manage knowledge transfer to the productive and the universities sector. A quantitative identification of variables instrument was designed. A total 51 surveys were applied to five public research centers, obtaining the following variables as the most significant: 1. feeling of belonging to the organization. 2. adequate training to generate innovation and intellectual capital and 3. technological developments trainings, the intellectual property management design, the models, the brands, the franchises, and the copyrights. Patent search in the following patent offices: EPO, JPO, USPTO, IMPI, and the establishments of letters of agreements, particularly in the intellectual property treaties, and the activities of each of the members of the team and finally the linkage of each company.

In the Research Center, there are few people that have the knowledge and experience needed to make linkages between companies and universities, and to apply the innovation projects to the CONACYT platform. Another limitation is that the staff that was interviewed travels very often. Further research in this area might consider expanding the sample from the research centers to 70% of the total number of centers of CONACYT.

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A FUZZY LOGIC APPROACH TOWARDS INNOVATION MEASUREMENT

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Anna M. Gil-Lafuente, Universitat de Barcelona
Gerardo G. Alfaro Calderón, Universidad Michoacana de San Nicolás de Hidalgo

ABSTRACT

Innovation is a convened critical factor for firm success in today’s economic environment. As academics and practitioners acquire knowledge on innovation, tendencies, points of view and practices arise. Yet measurement approaches meant to help decision makers to evaluate their current innovative position do not follow a main stream, moreover much of the information needed for an accurate evaluation tends to be qualitative or subjective. The objective of the present investigation is to review how Fuzzy Logic is currently dealing with subjective complex data in innovation management approaches, results will turn as implications for further applications in innovation measurement. An examination of new methodologies towards innovation measurement is presented and linked to a systematic review on Fuzzy Logic applications to innovation management. Results convey that there is no ultimate model to address innovation measurement in firms, yet a set of innovation measurement key issues are described in novel frameworks. Fuzzy Logic stands as a viable way to adopt decision-making due to its capacity of dealing with uncertain and subjective conditions. According to results, the use of Fuzzy Logic to evaluate qualitative and subjective factors in innovation measurement is encouraged.

JEL: O320, M100, M420

KEYWORDS: Innovation Measurement, Fuzzy Logic, Uncertainty, Decision Making

INTRODUCTION

Research on the concept of innovation has been evolving since the last decades, currently there is no manager or decision maker that could affirm that innovation does not carry competitiveness, it is in some way a given fact. As Porter (1990) states Companies gain advantage against the world’s best competitors because of generating innovations. The results of innovative activities in firms and organizations can range from effects on sales and market share up to the improvement of productivity and efficiency. The significant impacts in the sector of activity are the evolution of international competitiveness and the total productivity of the factors; the knowledge spillovers of innovations produced by enterprises and the growth in the volume of knowledge that flows over the network. Since there is a convened positive impact regarding innovation activities, scholars from diverse expertise address the topic. Gopalakrishnan and Damanpour (1997) identify three main groups of researchers: Economists, whose perspectives centers on growth at industry level and evaluate the impact of radical product and process innovation. Technologists, whose studies center around the process of generating and improving new technology; with a focus on radical and incremental product process innovations. Sociologists, whose studies mainly focus on the organizational features and the adoption of innovations within firms, and who study technical and administrative product and process innovations. As an effect of such widespread research, there are diverse approaches around the concept of innovation, in some way leading to inconsistencies. Several studies assess this gap by reviewing the evolution of the research on innovation (Garcia and Calantone, 2002; Hansen and Wakonen, 1997; Landry et al., 2002).
Due to the broad range of ways that the concept of innovation can be addressed, there is no definition that covers all the aspects of innovation. The earliest definition of innovation was established by Schumpeter (1934) stating innovation is what we call in a non-scientific way “economic progress”, which means in essence the use of productive resources in ways not tested yet in practice, and the retirement of the uses that have had so far. In a market oriented standpoint Drucker (1987) has pointed out that innovation is the tool in which innovative entrepreneur’s exploit the change as an opportunity for new, and Kanter (1983) claims that innovation refers to the process of establishing any new idea, which resolves a problem. A broader definition of innovation is established by the UK Department of Trade and Industry’s (DTI, 1998) implicating that innovation is the successful exploitation of new ideas. The Oslo Manual (OECD, 2006), mentions that innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations.

Topics within the definition of innovation compile concepts such as: progress, success, solution of problems, etc. Hence, knowing how innovative activities affect companies’ performance is also needed to be discussed, as it opens the path to attend an important challenge, which is to determine in a systematic way whether innovative efforts within firms are justified, objectives are being reached and the further generation of incentives (Cordero, 1990). The formula is somehow logic, we use information acknowledged in large studies concerning success and failure around innovation, then generate a checklist with the most relevant features and apply a scorecard with the best practices (Tidd and Bessant, 2013). However such logic faces complicated challenges as conceptions, terminology, and standpoints around innovation differ from authors and studies. Cooper (1979) centered attention on the evaluation of 77 success/failure key activities on product innovation. De Brentani (1991) expands the discussion introducing the study of service firms. Rothwell (1992) in a large-scale empirical study evaluated successful industrial innovations. Atuahene-Gima (1995) addressed market and project performance with 2 success dimensions. Benedetto (1999) took a product launch performance orientation, and Gerwin and Moffat (1997) addressed the challenge of evaluating 3 successful dimensions in order to establish relations between companies’ cultural activities and innovation. The mentioned works do not pretend to be an exhaustive list, instead show how authors focus on different types of innovation and measurements to evaluate firm’s performance often dealing with subjective, incomplete or vague information.

Through the last years uncertainty, understood as imprecision and imperfect or vague information in innovation management has been acquiring attention, see e.g. Macdonald et al. (1994); Gales & Mansour-Cole (1995); Hansen et al. (1998); Tidd (2001); Lane & Maxfield (2005); Hidalgo et al. (2008); Buddelmaney et al. (2009); O’Connor & Rice (2013); among others. As stated by Tidd and Bessant (2013) “by its nature innovation is about the unknown, about possibilities and opportunities associated with doing something new and so the process involves dealing with uncertainty”. A correct evaluation, quantification and comparison of the innovative competences of contemporary organizations is difficult since there is no single or main trend to assess innovation measurement (Frenkel et al., 2000). Yet a generalized measurement framework would provide a useful basis for managers to monitor and evaluate their innovation processes and create incentives around them (Cebon and Newton 1999). The objective of the present investigation is to address this gap by revising the main trends on practical frameworks of innovation measurement, identifying common critical elements and utilizing Fuzzy Logic to deal with subjective complex data. We have structured the paper as follows. The first section presents a literary review, containing preliminaries of the study, initial theories, framework to address innovation measurement and the main challenges of the topic. The second section comprehends the methodology that we used for the systematic review on the updated roll that Fuzzy Logic has on innovation management. The third section, results and discussion, presents the main findings of our study and analyze how Fuzzy Logic could aid decision makers in innovation management measurement. Finally we present our concluding comments.
LITERATURE REVIEW

When trying to assess performance measurement of innovation, we must establish some ground classifications. Neely et al. (1995) emphasize the need for a proper performance measurement of systems. They define performance measurement as the process of quantifying the efficiency and effectiveness of action. A performance measure can be defined as a metric used to quantify the efficiency and/or effectiveness of an action and a performance measurement system can be defined as the set of metrics used to quantify both the efficiency and effectiveness of actions. However positive managerial implications of a correct innovation performance measurement system have been (Simons 1990; Gimbert et al., 2010), scholars have not yet reached consensus on a definite approach (Nilsson et al., 2012). The widespread vision on innovation, its definitions and related inconsistencies addressed in the introductory section tend to be resilient challenges (Gopalakrishnan and Damanpour, 1997). Even though there is no definite consensus around the measurement of innovation, significant advances have flourished over the last years. Approaches like Adams et al. (2006) whose work focuses on the description of a holistic framework retrieving successful critical factors over the years of innovation measurement. Crossan and Apaydin (2010), whose work reveals extensive research on innovation, consolidating fundamental theories around innovation academic approaches; Edison et al., (2013) whose empirical studies describe a specific (yet scalable) industry framework; and the evaluation of dichotomies and established practices (Nilsson et al., 2012; Jensen and Webster, 2009).

Initial Theories

In order to understand the latest advances on innovation measurement we first must address the basic concepts on innovation, its principles and theories. Crossan and Apaydin (2010) compile peer-reviewed scientific academic research done over 27 years (1981-2008). The analysis includes a systematic review of 367 highly cited (minimum 5 citations per year using 2009 as base year) articles and organized them by level (individual, organization, macro, multilevel). Table 1 presents the quantity of researched articles found.

Table 1: Innovation Measurement Framework Areas

<table>
<thead>
<tr>
<th></th>
<th>Multilevel</th>
<th>Macro</th>
<th>Organization</th>
<th>Micro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Economics and evolution</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Network</td>
<td>2</td>
<td>4</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Resource-based view and dynamic capabilities</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Learning, knowledge management, adaptation, change</td>
<td>-</td>
<td>-</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>Other theories</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

Source: Adapted from Crossan and Apaydin (2010)

Learning, knowledge management, adaptation and change theories prevailed as the most concurred with 17 articles, followed up by 8 articles with foundations on Network theories and also 8 articles with roots on economics and evolution. In spite of these findings, authors conclude on not finding a strong underlying theory, and the theoretical perspectives that were employed tended to be quite disparate and generally operating at a single level. Conclusions on a lack of coherent and explicit theoretical base pair with those of Hobday (2005); Rothwell (1994); Tidd et al. (2006); Velasco & Zamanillo (2008), works that focus on reviewing the evolution of innovation models, finding again dissimilar approaches, e.g. Static and Dynamic Innovation (Afuah, 1998); Organizational Model of Technological Innovation (Kelly and Kranzberg, 1978); Model of Innovation of Schumpeter, Conversion Models, Technology – Push and Market – Pull Models, Marquis Model (Myers and Marquis, 1969); Strategic Option model (Freeman and Soete, 1997),

A Framework to Address Innovation Measurement

Since there is no ultimate model or theory to address innovation measurement, authors have chosen to develop frameworks that represent the main focus areas to consider. One of the latest approaches has been developed by Adams et al., (2006), work based on a review of six innovation models (Cooper and Kleinschmidt, 1995; Chiesa et al. 1996; Goffin and Pfeiffer, 1999; Cormican and Sullivan, 2004; Burgelman et al. 2004; Verhaeghet and Kfir, 2002) that proposes a seven-factor framework of categories specified in terms of the necessary structural capabilities in a firm to make and manage change. This holistic framework takes into account multiple perspectives e.g. Cooper and Kleinschmidt (1995) whose work focuses on the generation of five techno-centric factors for new product performance, yet overlooking the non-technical context of innovation; Chiesa et al. (1996) whose technical innovation audit tool explores a wide variety of indicators that are meant to evaluate the performance of systems and tools that managers hold in order to enable “hard innovations”. Cormican and Sullivan (2004) explore the continuous and cross-functional connections needed inside an organization to produce effective product innovations. Table 2 shows the holistic framework proposed by Adams et al., (2006).

Table 2: Innovation Measurement Framework Areas

<table>
<thead>
<tr>
<th>Framework Category</th>
<th>Measurement Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inputs</td>
<td>People</td>
</tr>
<tr>
<td></td>
<td>Physical and financial resources</td>
</tr>
<tr>
<td></td>
<td>Tools</td>
</tr>
<tr>
<td>Knowledge management</td>
<td>Idea generation</td>
</tr>
<tr>
<td></td>
<td>Knowledge repository</td>
</tr>
<tr>
<td></td>
<td>Information flows</td>
</tr>
<tr>
<td>Innovation strategy</td>
<td>Strategic orientation</td>
</tr>
<tr>
<td></td>
<td>Strategic leadership</td>
</tr>
<tr>
<td>Organization and culture</td>
<td>Culture</td>
</tr>
<tr>
<td></td>
<td>Structure</td>
</tr>
<tr>
<td>Portfolio management</td>
<td>Risk/return balance</td>
</tr>
<tr>
<td></td>
<td>Optimization tool use</td>
</tr>
<tr>
<td>Project management</td>
<td>Project efficiency</td>
</tr>
<tr>
<td></td>
<td>Tools</td>
</tr>
<tr>
<td></td>
<td>Communications</td>
</tr>
<tr>
<td></td>
<td>Collaboration</td>
</tr>
<tr>
<td>Commercialization</td>
<td>Market research</td>
</tr>
<tr>
<td></td>
<td>Market testing</td>
</tr>
<tr>
<td></td>
<td>Marketing and sales</td>
</tr>
</tbody>
</table>


Rather than giving specific measurement proxies of each category described in their framework, Adams et al., (2006) focus their attention on shedding light on useful implications around innovation measurement topics. Concluding remarks in the category inputs, reflect a need for the literature to balance, not only raw financial R&D and NDP key measurements, but also process and business model innovations. Tacit and softer skills that deal with knowledge and creativity require more attention on further input measurement. Knowledge management has to deal with explicit and implicit knowledge held by the organization in idea generation, knowledge reposition and information flows. Putting special emphasis on the correct measurement of codified information such as patents. Innovation strategy is found to follow two main orientations; the first is the measurement of whether the firm has an established innovation strategy and identifiable roles for new products and services. The second trend measures whether innovation strategy is a defined instrument that shapes and guides innovation in the organization. Special attention has to be brought to the measurement of the leaders or innovation “champions” as they have proven to be a driver towards innovation and strategic performance. Organization and culture must be measured in line with
both structural and psychological standpoints, as work environment stands as a known variable on the level of innovation in organizations. In this section the authors emphasize that much literature has been focusing in culture and organization, yet little is known about structural shift and flexibility in organizations. Portfolio management is a relatively new key topic in the literature, reflectors turn into this area as it deals with the allocation of scarce resources of the enterprise (money, time, people, machinery, etc.) on potential projects under uncertain conditions. Performance can be measured in this subject from different angles. Evaluation on quantity, quality, organizational capability, correct alignment to business objectives and balance in both risk and timespan seem to be some conductive approaches to measure portfolio management. Project management is one of the most challengeable topics, as it needs to measure the capability of an enterprise to create marketable innovations through specific inputs.

The plethora of dissimilar business activities makes it almost impossible to have a valid measurement layout, however, the evaluation of efficiency, tools, communication and collaboration on how a firm generates outputs is commonly addressed. Other factors such as internal collaboration, synergy and transparency had been named to be important, however not yet tested. The authors catalogue commercialization as the least attended topic in innovation management studies. Assessing the measure of marketing, sales, distribution and joint ventures, commercialization is one of the most important activities as it is the final step of the chain, and the real test for ideas to become successful innovations. Products launched per period, market analysis and monitoring tend to be the recurrent measures, although launch proficiency and post-launch reviews are new trend topics.

**Challenges on Innovation Measurement**

Encompassed with the early-discussed discrepancies, extent visions and differences in terminology, innovation measurement holds implicit challenges for decision makers. Nilsson et al. (2012) present a frame in which challenges assessed as dichotomies represent the main problems when attending radical and incremental innovation measurement in firms. Topics as uncertainty, defined not only as the inherent risk of an innovative project, but also as the possibility of different outcomes in a given situation (Loch et al., 2008), complexity and unfamiliar relations (Bordia et al., 2004) and lack of information (McLain, 2009). Time, distinguished as the management of different perspectives on timespan by a radical or an incremental innovation project. The flexibility of the companies’ processes, to launch a radical or an incremental innovation, while the structure and allocation of resources are some of the main constraints in pairing both perspectives (Adams et al., 2006). Control understood as the way firms manage the culture and working environment to pull up both incremental and radical innovations at the same time. Table 3 gathers the main dichotomies in innovation management found by Nilsson et al., (2012).

The dichotomies presented show the importance of a holistic framework, taking into account several perspectives in order to perform a measurement system that actually adds value to the company (Kaplan and Norton 1992; Micheli et al. 2010). Since our main objective is to identify main approaches on innovation measurement, the theories and models presented are addressed in a general and illustrative perspective; a robust theoretical review would need extensive depth, an issue that overreaches our present work scheme.

**DATA AND METHODOLOGY**

In order to appreciate how Fuzzy Logic could be useful to the resilient challenges that innovation measurement drags, we must first know which advances of the Fuzzy Logic theory had reached the scope of innovation management. In order to do so, we propose a systematic literature review (Denyer and Neely, 2004), this clear and reproducible procedure has shown increasing interest among scholars (Adams et al., 2006) and has proven efficiency in dealing with large amounts of information, establishing main paths: development of clear objectives, pre-plan auditable methods, quality execution of the search and synthesis
of impartial results using clear frameworks. In our case our main objective is to utilize peer-reviewed journals in order to explore the quantity and quality of articles that have a Fuzzy Logic methodology to address innovation. We concentrated the search in Thomson Reuters database ISI Web of Science, since it compiles one of the foremost influential pools of peer-reviewed articles (Crossan and Apaydin, 2010). Articles within the timespan of January 1986 until September 2014 were included in the search.

Table 3: Dichotomies in Innovation Management

<table>
<thead>
<tr>
<th>Dimension In Dichotomies</th>
<th>Issue In Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncertainty</td>
<td></td>
</tr>
<tr>
<td>Technical</td>
<td>Radical innovation:</td>
</tr>
<tr>
<td>Market</td>
<td>Requires a higher number of market and external environmental measures than incremental</td>
</tr>
<tr>
<td>Project scope</td>
<td></td>
</tr>
<tr>
<td>Strategy</td>
<td>Need to be measured on sales growth rather than profitability in the commercialization stage in contrast to incremental innovation</td>
</tr>
<tr>
<td>Resources</td>
<td>Requires high amount of data from different sources compared to incremental</td>
</tr>
<tr>
<td></td>
<td>Need to not be measured using strategic, operational and business model fit as a requirement why the opposite is needed for incremental</td>
</tr>
<tr>
<td></td>
<td>Prototypes or probes may replace traditional project management measures in the development of radical innovation</td>
</tr>
<tr>
<td>Time</td>
<td>Valuation and selection of idea and projects require different measures: ex. ROI, net present value (for incremental) vs. Opportunity cost (for radical).</td>
</tr>
<tr>
<td>Long and short (Length)</td>
<td>Radical need to be supported by measures that trace rapid and unexpected events and incremental measures that traces alignment to a predefined path.</td>
</tr>
<tr>
<td>Discontinuous and continuous (Rhythm)</td>
<td>Incremental innovation benefit from using the same measures for a long period of time</td>
</tr>
<tr>
<td>Rapid and slow (Pace)</td>
<td>More measures for external communication and for measuring relations needed for radical innovation.</td>
</tr>
<tr>
<td>Flexibility (vs. stability)</td>
<td>Radical innovation:</td>
</tr>
<tr>
<td>Process</td>
<td>Requires a broad number of quantitative and qualitative measures that can easily be exchanged</td>
</tr>
<tr>
<td>Structure</td>
<td>Requires measures to support strategy development i.e. what works and what does not why measures that control the alignment to goals and strategies are sufficient for incremental innovation.</td>
</tr>
<tr>
<td>Strategy</td>
<td>Measure identification and implementation for radical innovation require both audit (bottom up) and need driven procedures (top down) why incremental innovation is supported by a need driven procedure alone.</td>
</tr>
<tr>
<td>Control (vs. freedom)</td>
<td>Measurements need to be aligned to and support both radical and incremental recognition and reward systems</td>
</tr>
</tbody>
</table>

Source: retrieved from Nilsson et al., 2012.

In order to reach inclusion of a relevant set of articles, the selection criteria utilized was defined first by the Keywords: “Fuzzy Logic” and Innovation*. Document type: Article and Review. No further restriction selections were made. A total of 66 articles were retrieved, this initial set was fixed for further analyses. However, 19 papers were selected for deep analyses due to our criterion of including papers that have Fuzzy Logic as a methodological foundation. Table 4 presents how articles are scattered around different journals, from environmental and pollution to artificial intelligence topics. The diverse fields that Fuzzy Logic techniques covers describe the flexibility of the methodologies to address different problems of various scientific topics.
Table 4: Most Cited Journals

<table>
<thead>
<tr>
<th>Journal</th>
<th>Times Cited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proceedings of the IEEE</td>
<td>61</td>
</tr>
<tr>
<td>International Journal of Production Economics</td>
<td>53</td>
</tr>
<tr>
<td>Technovation</td>
<td>33</td>
</tr>
<tr>
<td>Engineering Applications of Artificial Intelligence</td>
<td>17</td>
</tr>
<tr>
<td>International Journal of Environment and Pollution</td>
<td>17</td>
</tr>
<tr>
<td>Production Planning and Control</td>
<td>10</td>
</tr>
<tr>
<td>Journal of Intelligent Manufacturing</td>
<td>7</td>
</tr>
<tr>
<td>Renewable Energy</td>
<td>5</td>
</tr>
<tr>
<td>Scientific World Journal</td>
<td>2</td>
</tr>
<tr>
<td>International Journal of Computers Communications &amp; Control</td>
<td>1</td>
</tr>
</tbody>
</table>

Source: retrieved from Web of Science 2014.

Figure 1 denotes an increasing trend of publications addressing innovation management with Fuzzy Logic techniques; also it shows the novelty of these kinds of studies in the formal sciences. The increment of publications shows the rising interest from scholars to adopt diverse perspectives to address innovation management.

Figure 1: Growth of Articles Assessing Innovation through a Fuzzy Logic Approach

Our methodology has certain limitations e.g. the utilization of the ISI Web of Science narrows the scope of search. A depth analysis discriminated 47 papers out of the original 66 due to diverse issues; the main one is the fact that authors catalogue their work as “innovative”; the introduction of that keyword misleads the search and results obtained.

RESULTS AND DISCUSSION

In this section we present the main findings of the systematic review. We firstly present aggregated results, a specific quantification of article type, followed up by an analysis of the innovation areas that the publications address. Secondly, we present a classification of the main approaches of the chosen articles.

Aggregated Results

From the 19 articles chosen for deep revision, the majority, 10 articles, present an empirical theoretical testing structure, putting into practice diverse Fuzzy Sets theories, being the most recurred theories the use of linguistic variables and fuzzy triangular numbers, thus dealing with imprecision or vagueness in information. A total of 7 articles propose the construction of theoretic frameworks, new approaches to deal with innovation management challenges with emphasis on uncertainty management and expert support systems. From the pool of articles only 1 describes a literature review, mainly focusing on soft computing industrial applications. Figure 2 shows the aggregated results by paper type of the 19 articles chosen for deep examination.
Figure 2: Aggregated Results by Paper Type

Quantification of results of the selected papers differentiated by type: empiric, literature review or theoretic. Source: Self-elaborated.

Continuing with the results, the selected papers were catalogued by the innovation area they address (Adams et al., 2006). The majority of the papers reach the scope of innovation inputs and multiple stages; the first oriented to new product development tools and the second addressing several areas of innovation within firms, no main trend of innovation management approach was identified. Knowledge management, portfolio management and actions outside of the firm were recurrent categories; surprisingly we did not find many publications specifically addressing innovation strategy nor organization and culture. It is encouraged to fulfill such gaps in the near future because of its importance in the survival of firms. Figure 3 shows the aggregated results of the 19 papers selected for deep examination by innovation area as proposed by (Adams et al., 2006).

Figure 3: Aggregated Results and Innovation Area

Number of articles differentiated by innovation area that selected papers attend. Source: Self-elaborated.

Categorization of Articles

A deep categorization of empiric and methodologically robust articles was performed. 14 out of the initial 19 articles were classified first by area of specialization, i.e. the main focus of their research paper. Secondly, the approach adopted towards innovation management. Thirdly the specific Fuzzy Logic methodology applied to address the area of specialization. Lastly, the articles were catalogued by the approach they carried out towards the definition of uncertainty. Table 5 presents the main findings over the deep examination of the selected papers.
<table>
<thead>
<tr>
<th>Author</th>
<th>Area of Specialization</th>
<th>Approach</th>
<th>Methodology</th>
<th>Uncertainty Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lin et al., (2011)</td>
<td>Tourists service management</td>
<td>Fuzzy model for the evaluation of performance in the service sector</td>
<td>Fuzzy Quality Function Deployment (Hisdal, 1988)</td>
<td>Uncertainties in the tourism service design process (Chien &amp; Tsai, 2000)</td>
</tr>
<tr>
<td>Zouggari and Benyoucef, (2012)</td>
<td>Supplier selection based on innovative characteristics</td>
<td>Fuzzy logic decision making support system</td>
<td>Fuzzy Analytic Hierarchy Process (Chang 1996, Wang et al., 2008b); Fuzzy Technique for Order Performance by Similarity to Ideal Solution (Hwang and Yoon, 1981)</td>
<td>Uncertainty as imprecision associated with information (Zadeh 1965)</td>
</tr>
<tr>
<td>Serrano and Robledo, (2013)</td>
<td>Evaluating Innovation Capabilities at University Institutions</td>
<td>Combination between a fuzzy logic system and the experience or knowledge of experts</td>
<td>Fuzzy inference system (Medina, 2006; Kosko, 1994; Mizutani and Sun, 1997)</td>
<td>Approximate characterization of phenomena that are too complex or illdefined (Zadeh 1975)</td>
</tr>
<tr>
<td>Achiche et al., (2013)</td>
<td>New product development</td>
<td>Fuzzy decision support models</td>
<td>Triangular fuzzy sets (Achiche et al. 2006; Duda 2001), Genetically generated Fuzzy Models (Achiche et al., 2004)</td>
<td>Approximate characterization of phenomena that are too complex or illdefined (Zadeh 1975)</td>
</tr>
</tbody>
</table>

Selected papers categorized by specialization, main approaches, methodological structure, and treatment of uncertainty. Source: Self-elaborated.
A deep analysis shows how authors tend to create decision making support models based on Fuzzy Logic to face the inherent characteristics of innovation (Segev et al., 2013). Moreover, they tend to focus models to a specific domain, e.g. Büyüközkan and Feyzioğlu, (2004); Achiche et al., (2013) for product development, Kong et al., 2008 for technological innovation capability. Zouggari and Benyoucef (2012) for partner selection models. Innovation is a complex activity, diversified, with a high amount of components that interact with each other creating new sources of ideas and it is difficult to discover the consequences that new events can develop, Escorsa & Valls (2003), in that issue, authors on Fuzzy Logic have combined rough quantitative indicators mixed with expert qualitative information (Kaklauskas and Zavadskas, 2007) to create a robust set of tools to assess innovation e.g. Taşkin et al., (2004); Serrano and Robledo (2013) for the evaluation of technological innovation capabilities for firms and institutions. The different factors such as competition, rapid markets, highly changing trends and advanced technology have to meet the shifting interests of the firm’s stakeholders, a correct visualization of the transversal innovation capabilities is needed, for that matter Maravelakis et al., (2006); Lin et al., (2011) propose Fuzzy Logic based holistic models for the evaluation of innovative capabilities, the first focusing on SME’s and the second on service sectors. Even with the diverse approaches to assess innovation, there is a common thing between the articles; the utilization of Fuzzy Logic techniques to address uncertainty in innovation management, whether faced as subjective judgments, partial truths (Ross, 2009), or approximation and characterization of phenomena that are too complex or ill-defined (Zadeh, 1965).

Uncertainty and Innovation

Uncertainty is an attribute of information, Zadeh (2006). Not simply the absence of information but inadequate, inexact, unreliable and border with ignorance, Funtowicz & Ravetz (1990). Information is the key of the concept because it can increase or decrease the level of uncertainty phenomena express, more knowledge illuminates that our understanding is more limited or that the processes are more complex than thought before, Van der Sluis (1997). For detailed studies about uncertainty, its evolution and diverse perspectives see Walker et al. (2003); Perminova et al. (2008). In the present study we will follow the idea in which uncertainty is present whenever an outcome of a process is not known due to the attributes on the information that surrounds the phenomena. In that sense, what distinguishes innovation management from gambling? Both involve committing resources to something which (unless the game is rigged) have an uncertain outcome (Tidd and Bessant, 2013).

It is widely accepted that the concept of Innovation involves uncertainty, imprecision and imperfect or vague information. The challenges faced then must be addressed by overrunning that level of uncertainty and providing useful tools in the terms of administration models for the analysis and treatment of variables, taking into account endogenous and exogenous elements, qualitative and quantitative information, among other components. When conceptualized as a process, the concept of uncertainty in innovation can be more visual, the importance of an understanding of innovation as a process is that it shapes the way in which we try and manage it Tidd (2001). The term innovation means a process as well as its result, Drejer (2002). I Ohme (2002) show an example of all the components involved within an organization. Figure 4 shows CIDEM innovation process model (i Ohme, 2002) which is a highly cited process innovation approaches and it was thought to evaluate and measure the intensity in which a firm conducts its innovative actions.

It is an accepted convention that external factors of the market involve uncertainty, Roberts (1998); Rese & Baier (2011); Tidd and Bessant, 2013; Bowers & Khorakian (2014). The facts of nature are uncertain; the economic, social, financial sphere of business change without ceasing; the acts of man – because he is free and provided with imagination – like relationships between mankind – because these are no robots – are all the fundamental causes of uncertainty, Gil-Aluja (2004). Economic environment, competitors, suppliers, available workforce, users, highly changing trends, technology, politics and R&D facilities are some of the elements that make the environment uncertain. These elements envelope the scope in which a firm will develop and manage innovation. The procurement and awareness that a firm upholds on external
information is base for the success upcoming projects. At an internal level of a firm, uncertainty plays a key role in diverse aspects: Creating New Concepts, Developing Products, Redesigning the Production Process and Redesigning of the Marketing Process, Managing Knowledge and Technology all need complex interactions and fast connections in order to generate effective outcome. “Economic life, in all of its possibilities, is submerged in this context and decisions have to be taken within its realm are even more complex as a consequence of the uncertainty in the outcomes of future events”, Gil-Aluja (2001). Table 6 shows the diverse sub-processes, which have been matched to elements that involve uncertainty in CIDEM’s Innovation Process Model.

Figure 4: CIDEM Innovation Process Model

Fuzzy Logic Models and Innovation

Studies with a fuzzy-oriented standpoint have been increasing since the last century and have proven efficacy while dealing with complex phenomena. As stated by Bellman & Zadeh (1970) “much of the decision making in the real world takes place in an environment in which the goals, the constraints and the consequences of possible actions are not known precisely”. The theory of decision under uncertainty initializes with the appearance of the article Fuzzy sets. Information and Control, Zadeh (1965), and has proven efficiency handling incomplete and uncertain knowledge information see Ribeiro (1996). The theory of Fuzzy Sets has been applied in the field of the formal sciences; nonetheless in the past 44 years researchers from all over the world have been publishing diverse research studies with applications in varied fields of knowledge.

As stated by Zadeh (2008) major implications about using Fuzzy Logic into innovation management could be in the machinery of linguistic variables and fuzzy if–then rules, which is unique to fuzzy logic, the concepts of precisiation and cointension that play important roles in nontraditional view of fuzzy logic, the use of Natural Language Computation that opens the door to a wide-ranging enlargement of the role of natural languages in scientific theories, enabling the Possibility theory, which may be viewed as a formalization of perception of possibility a direct relevance to knowledge representation, semantics of natural languages, decision analysis and computation with imprecise probabilities, and Fuzzy logic as a modeling language, which is natural when the objects of modeling are not well defined, e.g., data compression, information compression and summarization. The result of imprecisiation is an object of modeling which is not precisely defined. A fuzzy modeling language comes into play at this point. This is the key idea, which underlies the fuzzy logic gambit. The fuzzy logic gambit is widely used in the design of consumer products – a realm in which cost is an important consideration. Other applications that have successfully conducted the application of Fuzzy Logic in the fields of social sciences can be found in the
aggregation of municipalities under uncertain conditions towards the creation of synergies, Alfaro et al. (2012), aggregation of stakeholders for a better administration of enterprises see Gil-Lafuente and Barcellos de Paula (2013), a personnel selection model see e.g. Keropyan and Gil-Lafuente (2013). In our research, the adoption and further application of Fuzzy Logic methodologies has multiple significances, at a first instance it introduces the possibility of addressing uncertainty at a different standpoint than traditional methods, also it allows to group, assign, link and relate different variables whether endogenous or exogenous that are present in the process of innovation in certain circumstances of a firm.

Table 6: Elements of Uncertainty in an Innovation Process Model

<table>
<thead>
<tr>
<th>Process</th>
<th>Sub-Process</th>
<th>Elements on Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Creating New Concepts</td>
<td>Generating new product concepts</td>
<td>Evaluating market needs</td>
</tr>
<tr>
<td></td>
<td>Product innovation planning</td>
<td>Screening new concept ideas</td>
</tr>
<tr>
<td></td>
<td>Innovativeness and creativity</td>
<td>Selection of new or enhanced products</td>
</tr>
<tr>
<td></td>
<td>Exploiting innovation</td>
<td>Planning product innovation</td>
</tr>
<tr>
<td></td>
<td>Product development process</td>
<td>Favoring creativity and inventiveness</td>
</tr>
<tr>
<td></td>
<td>Teamwork</td>
<td>Evaluating alternatives for developing new business opportunities</td>
</tr>
<tr>
<td></td>
<td>Transfer to manufacturing and</td>
<td>Choosing appropriate people for critical innovative roles</td>
</tr>
<tr>
<td></td>
<td>distribution</td>
<td></td>
</tr>
<tr>
<td>2. Developing Products</td>
<td>Formulating a manufacturing</td>
<td>Managing product development projects</td>
</tr>
<tr>
<td></td>
<td>strategy</td>
<td>Facilitating communication among different groups</td>
</tr>
<tr>
<td></td>
<td>Implementation of new processes</td>
<td>Establishing role and priority projects</td>
</tr>
<tr>
<td></td>
<td>Continuous improvement</td>
<td>Defining states of project managers in the organization</td>
</tr>
<tr>
<td>3. Redesigning the Production</td>
<td>Formulating marketing strategy</td>
<td>Integrating customer needs in product development</td>
</tr>
<tr>
<td>Process</td>
<td>Product introduction</td>
<td>Establishing of cross-functional teams</td>
</tr>
<tr>
<td></td>
<td>Product promotion</td>
<td>Matcher process capabilities to the requirements of the marketplace</td>
</tr>
<tr>
<td></td>
<td>Product placement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Managing intellectual property</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Human Resources</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Systems</td>
<td></td>
</tr>
<tr>
<td>4. Redesigning of the Marketing</td>
<td>Formulating technology strategy</td>
<td>Grouping affine products for effective market introduction</td>
</tr>
<tr>
<td>Process</td>
<td>Product introduction</td>
<td>Assigning the best placement of products</td>
</tr>
<tr>
<td></td>
<td>Product promotion</td>
<td>Link market preferences to image</td>
</tr>
<tr>
<td></td>
<td>Product placement</td>
<td>Relating customers characteristics to products or services</td>
</tr>
<tr>
<td></td>
<td>Managing intellectual property</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Human Resources</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Systems</td>
<td></td>
</tr>
<tr>
<td>5. Managing knowledge and</td>
<td>Formulating technology strategy</td>
<td>Choosing sources of technologies (In house), R&amp;D, licensing, partnering, etc.</td>
</tr>
<tr>
<td>Technology</td>
<td>Selection generation and sourcing of technology</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Adapted from Chiesa et al. (1996)

**CONCLUDING COMMENTS**

The purpose of this study is to review how Fuzzy Logic is currently dealing with subjective complex data in innovation management; the objective is to show the relevance of such methodologies and techniques in innovation measurement approaches. A systematic review within the timespan of January 1986 until September 2014 is proposed; papers from Thomson Reuters database ISI Web of Science were utilized. Results show an increasing interest for assessing innovation management theories under a Fuzzy Logic approach. Decision support making models for innovation management were found to be the most numerous articles in the systematic review. The treatment of information under uncertain conditions with a high level of confidence is considered to be one of the main benefits of utilizing fuzzy logic techniques around innovation management. Although there is no ultimate path for measuring innovation in firms, new frameworks lead the discussion towards a set of key activities that must be covered for a firm to continuously revise their innovative capabilities in order to achieve competitive advantages, however much of the information needed to support those key activities tend to be qualitative or subjective. There are several recognized limitations to our study, firstly, we focused on gathering research and categorizing it,
such classification may have omitted relevant topics. Secondly, our review uses only one database; such database may have omitted relevant research. Thirdly, the timespan and filtering methods may have also omitted relevant papers. Further research needs to be conducted, firstly to apply the Fuzzy methodologies on specific conditions, and secondary to keep reconnoitering additional Fuzzy Logic models, which could support decision making under undefined environments. Results motivate the use of Fuzzy Logic methodologies in social studies as key for the development of effective innovative strategies in enterprises towards the creation of competitive advantage.

REFERENCES


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FINANCIAL LIBERALIZATION: A FOURTH GENERATION THOUGHT
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Chathuri Senarath, University of Kelaniya, Sri Lanka

ABSTRACT

Empirical studies in the late 1980s and 1990s on financial liberalization lent support to the reforms carried out in line with the Mckinnon-Shaw hypothesis. Later evidence shows financial liberalization failed to achieve its desired results in many countries. Thus, the emphasis of current literature is to identify and explain the reasons for non-achievement of expected objectives to be realized through financial liberalization. An extensive literature survey done through this study reveals two main reasons for this failure. One is the incorrect policy procedure being followed in implementing financial liberalization referred to as a sequential problem. The other is to have policy inconsistencies during the reforming periods, referred to as a macroeconomic problem. This paper analyses the theoretical evolution of financial liberalization considering the empirical evidence presented by researchers through first, second and third generations of financial liberalization. The objective is to develop a more comprehensive analysis that can be identified as a fourth generation model of financial liberalization. Future researchers can make use of this model in their empirical analysis on measuring the success of financial reforms in various countries.

JEL: G000, G010

KEYWORDS: Financial Liberalization, Mckinnon-Shaw Hypothesis, Sequential Problem, Macroeconomic Problem, Fourth Generation Model

INTRODUCTION

The relationship between finance and economic growth has been debated for quite a long time. The importance of finance for achieving a high economic growth from a modern point of view has been recognized initially during the beginning of the 20th century. Becker (2002) argued that Schumpeter (1911) was the first scholar to argue that financial resources were required for technological innovations and economic growth. Schumpeter further argued that one can only become an entrepreneur by becoming previously a debtor. Following these views Keynes (1936) also highlighted the importance of increasing financial savings for investment and thereby speeding up economic growth, although he did not talk about the specific modalities in this regard (as cited by Arestis, 2005).

Gurley and Shaw (1955) published their seminal paper of the role of finance on economic growth by drawing attention to the significance of financial intermediation and the role of credit supply for economic growth. Patrick (1966) highlighted three ways in which financial systems can influence the capital stock to acquire an economic growth. Goldsmith (1969) mentioned that having a “financial super structure” was necessary although it was not a sufficient condition for acquiring an economic growth. Patrick and Park (1994) pointed out the positive role that finance can play to achieve economic growth. According to Levine (1997) the financial market lubricates the economy by providing liquid funds and the expertise required for growth and investment (as cited by Arestis, 2005). In contrary to the above view points, there are many others who disagree partly or sometimes even fully with the viewpoints expressed in support of the relationship between finance and economic growth and development. Robinson (1952) argued that financial development primarily follows after economic growth and the financial system does not matter.
That is economic growth develops entrepreneurship and other variables of development in a country and these developments will ultimately bring the financial development (as cited in Arestis, 2005). Which shows that, entrepreneurship leads to develop a financial system and not the other way around. Andres et al. (1999) also through their empirical analysis based on Organization for Economic Co-operation and Development (OECD) countries did not find any positive link between growth and financial development (as cited by Paudel, 2007).

In 1973, a path breaking contribution was made by McKinnon and Show (McKinnon-Show hypothesis) through theoretical basis as well as empirical evidences, that adopting liberalized financial sector reforms in developing countries will precede to economic development. These findings lead to the opening up of the financial markets in many developing nations in order to get out of the financial repression and achieve economic growth as desired. More than three decades have passed liberalizing the financial system in many counties but the results were not good as anticipated. Mokhtar and Fatemah (2007), Arestis (2005) and Dooley (1997) and Edwards (1989) have attributed the failure of financial liberalization to achieve its expected outcomes to the incorrect sequence of policies being followed in implementation stage of financial liberalization (sequential problem). However it should be noted that these research findings have not been sufficiently tested and sustained empirically.

Extensive literature analysis on the sequential problem and macroeconomic problem has shown that there is a methodical process that needs to be followed when implementing the financial liberalization in a country in terms of policy implementation. However, no research has so far been done in order to identify the order of financial liberalization theoretically. Further it is crucial to identify how macroeconomic factors need to behave to influence the desired financial liberalization outcomes. Therefore the main objective of this study is to develop a model and identify the procedure to be taken when implementing financial liberalization in a country. When analyzing financial liberalization literature it shows that ‘Southern Cone experience’ has led to produce ‘First and Second generation’ models and the ‘East Asian currency crisis’ has led to create the ‘Third generation model’. The conceptual frameworks been developed through this study draws attention to generate a ‘Fourth generation model’ which has been developed by analyzing the failure of the financial liberalization (Sequential problem and macroeconomic problem). This can be considered as the next development of financial liberalization hypothesis, and hence, this name is author coined. In order to develop the model constructively this paper is divided in to four parts. The first part will provide an introduction about research, the second part which is the literature review will provide an extensive analysis on the theoretical arguments and empirical evidences on financial liberalization, the third part will develop the sequential model for financial liberalization in a country and finally the fourth part will provide the conclusion of the study.

LITERATURE REVIEW

Theory of Financial Liberalization- Theoretical Evolution

Gemetch and Struthers (2003) stated that McKinnon-Shaw hypothesis in its various forms is thirty years old. During this period literally hundreds of empirical studies have been done examining the hypothesis in many different context. Initially it focused on financial repression and the need for developing economies to allow real interest rates (along with other financial indicators) to be determined by market forces. In later years the researches have extended the debate to consider other effects of financial repression on economic growth, financial crisis and poverty. According to this the literature on financial liberalization can be classified into a number of approaches since the original McKinnon-Shaw hypothesis as follows:

First Generation approach (Krugman 1979)
Second Generation approach (Obstfeld, 1996)
Third Generation approach again represented by the work of Krugman (1998, 1999)
When looking at the original Mckinnon-Shaw hypothesis, Mckinnon (1973) suggested that financial liberalization would lead to higher rates of economic growth. Savings in the formal financial system is limited under conditions of financial repression. When interest rates are allowed to rise to market-clearing levels, there would be an increase in domestic savings and a portfolio shift out of inventories, precious metal and foreign exchange. In addition, borrowers would be able to shift from unorganized markets to the formal financial system. High real interest rates would actually increase investment because of the need to accumulate funds to undertake lumpy investments. This makes money and physical capital complementary rather than substitutive assets. This “complementary hypothesis” suggests that raising controlled interest rates would raise the demand for domestic savings and time deposits lower the cost of accumulating funds for the purchase of physical capital and thereby promote economic growth. Shaw (1973) argued that raising interest rates would also improve the quality of domestic investment. When interest rate is below equilibrium level total investment will be limited by the amount of savings available. Higher interest rates would attract more savings into the financial system and increase investment. In addition, previously unfunded projects with high returns (optimal projects) are likely to be funded. The efficiency of the banks in providing funds to projects with high returns will lead to enhance the economic growth of a country than the money circulation in the informal markets inefficiently.

The ‘First Generation’ model of currency crisis (Krugman, 1979) is the next developments of financial liberalization after the Mckinnon-Shaw hypothesis. The first generation models focus on inconsistencies between domestic macroeconomic policies such as an exchange rate commitment and a persistent government budget deficit that eventually must be monetized. The deficit implies that the government must either deplete assets such as foreign reserves or borrow to finance the imbalance. However, it is infeasible for the government to deplete reserves or borrow indefinitely. Therefore, without fiscal reforms, the government must eventually finance the deficit by creating money. Since excess money creation leads to inflation, it is inconsistent with keeping the exchange rate fixed and first-generation models therefore predict that the regime inevitably must collapse. The ‘Southern Cone experience’ which is the financial crisis of Latin American economies such as Uruguay, Argentina and Chile in the late seventies has led to the development of the ‘First Generation’ of currency crises models.

The ‘Second Generation’ of models (Obstfeld, 1996) suggest that currency crises may also occur as a result of self-fulfilling expectations, speculative attacks and changes in market sentiments despite sound fundamentals. In this framework, a speculative attack is more likely to succeed if higher interest rates exacerbating existing weak domestic employment or banking sector conditions. Consequently, the timing of the attack and whether it will occur cannot be determined as it is no longer unique. The fundamental imbalances stressed by first-generation models make a country vulnerable to shifts in investor sentiment, but once a crisis does occur the second-generation models help to explain its self-reinforcing features.

The ‘Third Generation’ Models (Krugman, 1998, 1999) attempt to stylize the causal mechanics underpinning the 1997 ‘East Asian currency crisis’, as the First and Second Generation models did not fully explain this phenomena. One version of the ‘Third Generation’ model attributes the crisis to implicit guarantees offered by domestic banks in developing countries leading to a massive influx of short-term capital which turns out to be unsustainable. This invariably results in an asset price bubble that is destined to burst and reverse the capital inflows. Another version of ‘Third Generation’ model identifies the existence of ‘Fragile Financial Institutions’. These have existed as the cause of the buildup of un-hedged short-term borrowing denominate in foreign currency. A sudden change in market sentiment can cause panic and investor responses which bring about a reversal in these capital flows. This transforms an illiquid asset into insolvency and ultimately a currency peg collapse (as cited by Gemech and Struthers, 2003).

When reviewing the above evidences it is possible to detect a clear lineage stemming from the original Mckinnon – Shaw (1973) contribution in the later developments as well (Gemech and Struthers, 2003). Thus, the financial repression has led to the proposition of original financial liberalization. The ‘Southern Cone experience’ in the nineteen seventies has led to ‘First and the second generation’ models
and the ‘East Asian Currency Crisis’ in the late nineteen nineties has led to the development of ‘Third generation’ model.

**Empirical Evidence on Financial Liberalization**

Having considered the background that demanded a financial liberalization and its theoretical underpinning, it is important to look at empirical research conducted in this regard. During the late 1970s and 1980s, a number of financial sector reforms such as deregulation of interest rates, revamping the direction of credits and the measures to promote competition in the financial service have become an integral part of the overall structural adjustment programmes in many developing countries. In this background, Gemech and Struthers (2003) have cited number of empirical studies conducted. For the purpose of this study, few selected major studies are summarized below (Table 1) in a chronological order. Thus, the results of the most empirical studies provide limited justification to the financial liberalization ideology leading to inconclusive conclusions.

**Table 1: Empirical Studies on Financial Liberalization**

<table>
<thead>
<tr>
<th>Name of the researcher</th>
<th>Year</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Giovannini</td>
<td>1985</td>
<td>Taking 18 developing countries, empirically tested responses of consumption to real interest rates, findings were mostly negligible and negative.</td>
</tr>
<tr>
<td>2. Ostry &amp; Reinhart</td>
<td>1992</td>
<td>Empirically tested the responses of consumption to real interest rates, also concluded that relationship was negligible or negative.</td>
</tr>
<tr>
<td>3. Ogaki et al.</td>
<td>1996</td>
<td>Analyzed the role of the capital market on aggregate savings and growth due to financial deregulation. The authors concentrated on OECD countries using panel date for the period of 1960 to 1987 and concluded that financial deregulation in the 1980s has caused a decline in the national savings and growth rates of these countries.</td>
</tr>
<tr>
<td>4. Demirgü-Cüç &amp; Detragiache</td>
<td>1998</td>
<td>Analyzed the financial liberalization and financial fragility covering 53 different counties. The study covered the period of 1980-1995 and used econometric techniques to draw their conclusions. The paper emphasizes institutional reforms for reducing crisis.</td>
</tr>
<tr>
<td>5. Bandiera, et al.</td>
<td>2000</td>
<td>Constructed an index of financial liberalization on the basis of eight different components: interest rates, reserve requirements, directed credit, bank ownership, prudential regulation, securities markets deregulation and capital account liberalization. Their data spans from 1970 to 1994 for eight countries. Among the key findings of the estimate of their benchmark model is that there is no evidence of any positive effect of the real interest rate on saving.</td>
</tr>
<tr>
<td>6. Reinhart and Tokatlidis</td>
<td>2001</td>
<td>In a study of 50 countries (14 developed and 36 developing) reported that financial liberalization appears to deliver: higher real interest rates (reflecting the allocation of capital toward more productive, higher return projects.), lower investment but not lower growth (possibly owing to a shift to more productive uses of financial resources), a higher level of foreign direct investment and high gross capital flows. Liberalization appears to deliver financial deepening as measured by the credit and monetary aggregates but low income countries do not appear to show clear signs of such a benefit.</td>
</tr>
<tr>
<td>7. Kaminsky and Schmukler</td>
<td>2001</td>
<td>Studied 28 developed and emerging economies, using 3 measures of financial liberalization (capital account liberalization on interest rates, credit and reserves and stock market liberalizations) and concluded that; i) Liberalization is not a continuous process in emerging economies, ii) Liberalization leads to booms and busts in emerging economies especially in short run, iii) Quality of institutional governance is crucial to process.</td>
</tr>
<tr>
<td>8. Baldicci et al.</td>
<td>2002</td>
<td>Empirically tested the impact of financial crises (large scale nominal currency depreciation) on poverty and income distribution and it found: i) Formal and informal sector effects, ii) Relative price changes after crises raise price of imported food, iii) Fiscal retrenchment affects public services, iv) “Better off” is affected by wealth consequences of real interest rates and real estate prices.</td>
</tr>
</tbody>
</table>

*This table shows few selected empirical studies done on financial liberalization in a chronological order.*
Financial Liberalization: Background for New Trends

A number of new researches have been carried out on financial reforms with the premise that financial liberalization has been a failure and they have also analyzed the causes for such a failure as well. This trend is further continued and according to Arestis (2005) no convincing empirical evidence has been provided in support of the success of financial liberalization hypothesis. Further, as cited by Arestis (2005), Lucas (1988) argued that economists ‘badly over-stress’ the role of the financial system and thereby it is difficult to agree on the link and its direction between finance and growth.

But proponents of financial liberalization thesis argue that failure is there because of the existence of inadequate banking supervision and macroeconomic instability. This shows that the failure of financial liberalization to live up to its potential had reignited the opponents of financial liberalization and at the same time giving proponents of the financial liberalization a new lease of life. In this regard Mckinnon (1973 and 1993) himself had played a prominent role. Among others Krueger (1986) and Edwards (1989) are also prominent personalities, who saw nothing wrong with financial liberalization but emphasized that the way in which financial liberalization was implemented and certain other factors eroded the effectiveness of financial liberalization. Furthermore, when drawing attention to studies such as Mokhtar and Fatemah (2007) they highlighted some other aspects of the problem. Accordingly, for the failure of financial liberalization they have identified such prominent reasons as i) not following a correct order in financial reforms and ii) having a macroeconomic instability. Further, confirming the same causes Arestis (2005) emphasized that the ‘adequate banking supervision’, ‘macroeconomic stability’ and the ‘correct sequencing of financial reforms’ among other requirements needed for the success in financial liberalization and shows that these root causes needed to be addressed appropriately. Edwards (1989) also agreed with Mokhtar and Fatemah (2007) and Arestis (2005) by identifying that the failure of financial liberalization is because of not having appropriate sequencing, speed of reforms, trade regime problems and accompanying macroeconomic structural reforms.

When analyzing the above findings of the scholars for the failure of financial liberalization to achieve its desired objectives, they have emphasized two main reasons, one is incorrect policy procedure being followed in implementing financial liberalization (sequential problem) and the other is having policy inconsistencies / imbalances / influence (macroeconomic problems) during the reform periods distorting the financial liberalization outcomes. These conclusions draws the attention to identify that a successful implementation of financial liberalization depends on the correct sequence been followed and balanced macroeconomic policies. Therefore, this study draws attention to generate a new model which identifies the correct sequence to be followed with the appropriate macroeconomics policies in order to liberalized the financial sector of a country successfully.

Findings: The Fourth Generation Model

The ‘fourth generation model’ emphasizes the importance of following a correct sequence for acquiring a successful financial liberalization. Arestis (1989) stated that sequencing contains two interrelated questions: (i) what is the optimal speed of reforms? (i.e. overnight / one shot vs. Gradual) and (ii) in what order should markets be deregulated and liberalized? Although the sequential analysis mainly deals with the second question, it is also important to look at the first question with the intention of further highlighting the significance of the second question. Krueger (1986) is quiet emphatic in advocating a rapid dismantling of distortions. In this it is clear that she argued with the premise of welfare as well as the credibility considerations. The argument is mainly rooted in claiming that once the protectionist regime is taken out there will be a drop in welfare considerations and once the masses feel that they are not better off it is likely to create credibility concern leading to derailing the financial liberalization process. Thus, an overnight liberalization is seen as a better option in preventing gradual resentment of financial liberalization (Kelegama, 1989). However, it should also be noted that an overnight policy is likely to have two kinds of
costs to the economy viz. adjustment cost of the balance of payments and the increase in distributional costs. In this premise, it is argued that a gradual, multistage implementation is superior to overnight completion. Edward and Van-Wijnbergen (1986) using a two-period inter-temporal model have also concluded that it is advisable to implement gradual reforms. Hebbel and Hernández (2001) also said that excessively rapid financial reforms lead to unsustainable credit and boom activities that ultimately cause a financial crisis. That is why prudential regulation and strong supervision of banks and financial institutions and other liberalized capital market reforms are essential. Similarly, Andersen and Tarp (2003) also focused on the sequential process of liberalization and concluded that a smoothly functioning of financial system has a vital role in economic growth. However, he has emphasized that it should be applied in a suitable sequential order with sufficient time and an appropriate middle way for financial sector reform rather than haphazardly applying liberalization (as cited by Paudel (2007).

In addressing the second question ‘In what order should markets be deregulated and liberalized’ available literature allows the identification of two schools of thought: one school which looks at the phases in financial liberalization whereas the other school looks at a more wider scope looking at real (stabilizing) reforms first and financial reforms second. Edwards (1989) provided a number of views which support the second school of thought. Accordingly, Mckinnon and Mathison (1981) highlighted that liberalization will have a better chance of succeeding if undertaken with a fiscal surplus. This was supported by Mckinnon (1984) identifying that the main problem with aborted liberalization is that they have been accompanied with massive capital inflow that results in real appreciation. Best way to avoid the need for foreign funds is to achieve fiscal surplus prior to the liberalization. Further it was identified that since inflation generates serious distortions, liberalization will take place under inappropriate signals.

Thus, inflation should be brought down first (Fischer, 1986, 1989). Sachs (1987, 1988) through historical evidences from successful Asian countries has shown that stabilization should be consolidated before attempting trade reforms (as sited by Aretis 2005). Finally Gibson and Tsakalotos (1994) stated that domestic financial liberalization is to be made after the industrial and real sector liberalization and before the external financial sector's liberalization; otherwise credit would flows from the banking sector to the protected industrial sector. If protection of the industrial sector is removed it would suffer in many ways and that the domestic financial sector is to be freed before the external financial sector to control the plight of capital from the national economy. Mokhtar and Fatemah (2007) also gave the trade reforms first and then financial reforms view point in a very concise manner stating that “the majority of the authors (Edwards 1986, 1990; McKinnon 1982, 1991; Krueger 1986) agreed on the existence of four great sequences in the process of liberalization. Accordingly it is identified that in liberalizing, domestic financial liberalization (sequence 2) must follow domestic real liberalization (sequence 1) and precede liberalization of foreign trade (sequence 3) and that of the capital movements (sequence 4)”. This sequence is shown in the table 2. However, it should also be noted that there exist substantial opposition for ‘one optimal sequence’ as identified above. Krueger (1986), is non-committal as for trade liberalization first or simultaneous implementation of both policies (real or reforms). Edwards (1989) and Mokhtar and Fatemah (2007) also noted that there is a great controversy around the order of stabilization policies and liberalization of the foreign trade, citing Funke (1993) who concluded that the direction of causality between the external and domestic financial liberalization is less clear. Perhaps such arguments against an optimal structure were fuelled by the fact that a number of researchers based on the ‘southern cone’ financial liberalization experience show that Uruguay and Argentina did not follow the commonly accepted sequence. However, Chile did follow the stipulated sequence but all three countries ended up with the same story of ‘financial liberalization failure’. Nevertheless when weighting the thoughts for and against a better way of making financial liberalization, majority is definitely in favor of following a more rational financial liberalization (optimal) sequence as highlighted by the Table 2.
Table 2: Optimal Sequence of Liberalization

<table>
<thead>
<tr>
<th>Sector</th>
<th>Domestic</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real</td>
<td>- fiscal discipline (stability)</td>
<td>03. liberalization of current transactions</td>
</tr>
<tr>
<td></td>
<td>- elimination of implicit and explicit taxes and subsidies</td>
<td>03. creation of foreign currency exchange market and currency convertibility</td>
</tr>
<tr>
<td></td>
<td>- privatization 02.</td>
<td></td>
</tr>
<tr>
<td>Financial</td>
<td>- restructuring/privatization of the domestic bank system</td>
<td>04. control elimination on capital movement</td>
</tr>
<tr>
<td></td>
<td>-creation/reactivation of the money market</td>
<td>04. total currency convertibility</td>
</tr>
</tbody>
</table>

This table shows the optimal sequence of liberalization according to Mokhtar and Fatenmah (2007). Firstly, a country should liberalized its domestic real sector. Following that domestic financial sector could be liberalized. Afterwards, external real sector which is international trade could be liberalized and finally, external capital movements can be open up.

With regard to ‘optimal sequence’, the onus is now to look at some of the important justifications available regarding the sequences highlighted by Mokhtar and Fatenmah (2007). Firstly, McKinnon (1993) stated that trade liberalization should only take place after the fiscal deficit is eliminated sighting the infamous ‘southern cone’ experience and emphasizing that government will face no necessity to borrow from abroad to finance (which leads to the over-borrowing syndrome) its expenditure. Thus, the need for capital inflows during the transition will be minimized. There after it needs to get the domestic financial markets liberalised in line with the McKinnon-Shaw hypothesis.

Further Edwards (1989) extracting the comments of Frankel (1982) stated that goods and asset markets clear at different speeds. While asset markets clear almost instantaneously, the attainment of equilibrium in the goods market usually takes some time. Thus, Frankel argued a synchronization of the structural reform process will call for the goods markets (i.e. the current account) to be liberalized before the capital account. In addition Mckinnon (1993) and Edwards (1989) also stated that financial liberalization will result in capital inflow and it will result in a real exchange rate appreciation which in turn de-protects the tradable sector. It is argued that in order to ensure success of the trade reforms it is crucial to avoid real exchange rate overvaluation. Hence, opening up external financial sector should be the last in an optimal sequence of liberalization.

The Model for Sequential Analysis

Based on the above extensive theoretical rationale a conceptual frame work for testing the sequential analysis is developed as shown below (Figure 1). Based on conceptual framework developed it is possible to investigate the sequential procedure of liberalization to determine whether a country has followed the optimal sequence of liberalization or not in determining its success. Thus, the model first looks at whether there is evidence to suggest that real sector liberalization has taken place in creating conducive environment for financial liberalization. Then, the model tries to find out evidence to decide whether the domestic financial sector has been liberalized. Next, evidences are collected to see whether the external sector has been liberalized. Finally, all three stages are monitored together in substantiating whether the Financial liberalization undertaken has followed the correct sequence of financial liberalization or not.
Figure 1: Model for Optimal Sequence of Liberalization

This figure shows the optimal sequence of liberalization that needs to be followed during the financial reforms. Firstly a repressed economy should liberalized the real sector. Afterwards they should take steps to liberalized the domestic financial sector. Finally a country needs to liberalized its external financial sector in order to become a fully liberalized economy.

CONCLUSION

The financial liberalization based on the Mckinnon-Shaw hypothesis calls for more liberal financial sector reforms to acquire a higher economic growth. The early hypothesis of McKinnon and Shaw (1973) assumed that financial liberalization, would be associated with higher real interest rates. As a result of lifting control policies and reducing inflation would stimulate saving assuming that saving is responsive to interest rates. Finally higher saving rates were assumed to finance a higher level of investment leading to higher economic growth. Subsequently, there were further developments to financial liberalization through the ‘first generation’ and ‘second generation’ models which mainly addressed the rapid reversals in international capital flows, self-fulfilling expectations, speculative attacks and changes in market sentiments that were evident with the financial crisis faced by the ‘Southern Cone’ countries in the 1970s. Then, the ‘third generation’ model attempted to stylize the causal mechanics underpinning the 1997 ‘East Asian currency crises’ since the first and the second generation models did not fully explain this latter phenomenon. Despite all these developments and experiences, financial liberalization in many countries has not been successful and were unable to produce the expected outcomes from liberalization of the financial sector. With respect to this argument scholars have identified two key reasons for the non achievement of stated outcomes of financial liberalization.

That is the incorrect policies being followed in implementing financial liberalization (sequential problem) and policy inconsistencies (macroeconomic problem) in eroding the outcomes of financial liberalization. Taking these reasons for the failure into consideration fourth generation model of financial liberalization has been developed. This model clearly shows the correct path that needs to be followed when implementing financial liberalization in a country. Further it will also be useful to identify the reasons for the failures if the financial liberalization has not provided the desired outcomes in a nation. Therefore, this developed new model will bring a new evolution to the studies in the area of financial liberalization.

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BRAND-SWITCHING IN NIGERIAN BANKS: EVIDENCE FROM CRITICAL INCIDENTS

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Chinedum Nduka, Michael Okpara University of Agriculture, Umudike, Nigeria
Ebere Rejoice Okocha, Evangel University Akaeze, Ebonyi State, Nigeria

ABSTRACT

This paper investigates the critical incidents that characterize interface between banking service providers and their customers. The study also assesses the effects of critical incidents on the brand switching behavior in Nigeria Money Deposit Banks. Data were collected via self-administered questionnaire to customers of the banks under review in Nigeria. Some 150 customers were sampled using a combination of multistage and purposive sampling techniques. Data were analyzed using descriptive statistics and a correlation model. Empirical findings indicate that critical incidents are more significant among other variables that influence brand-switching in Nigeria Banks. Customers in the banking industry accommodate negative critical incidents from service-providers to a level of elasticity before brand-switching takes place. We also found a significant and strong positive relationship between negative critical incident and brand-switching. The study therefore recommends that service providers should consciously create positive critical incidents that would increase customers’ expectation/loyalty. The value of the study would proffer solutions to customers switching behavior.

JEL: M3, G2

KEYWORDS: Critical Incident Technique, Switching Behavior, Brand Loyalty, Brand Switching and Customer Satisfaction

INTRODUCTION

In the competitive Global market, consumers and customers are regarded as valuable assets for any vision oriented organization. Research shows that organizations increasingly focus on the retention of their existing customers. Thus gaining knowledge about customers’ switching behavior is substantively important for the sustainability of any organization. The success of any organization depends on the satisfaction of its customers, as consumers are the end users of any product or service. It has been shown that although customers may express their satisfaction, they nevertheless frequently switch brands (Liyander et al 1998). There is an increasing need to understand the customers switching path and why they switch to other brands.

According to Van and Verhoef (2008), switching paths consist of a sequence of various combinations of critical encounters or events leading to a switching decision. Thus, the switching process starts with customer awareness of some negative aspects in the decision, although a complete absence of such negative incidence is impossible. These negative perceptions have led to customer cognitive dissonance and service/product failures. The fundamental problem in predicting customer choices exist in the fact that brand switching decisions of the customers are made on the bases of several different criteria which simultaneously include factors like brand image, brand features, service quality and price etc. Frequent switching behavior of customers compelled the researcher to review factors that affect the service industry.
The problem has been more compounded in the service industry where customers get attracted to competitor offerings especially when their expectations do not meet with their perceptions.

This study analyzed brand-switching in Nigerian banks based on evidence from critical incidents. Specifically, the study examined: 1) relevant demographic characteristics of the respondents. 2) brand-switching variables and extent of their significance to brand switching. 3) brand-switching behavior of the respondents towards critical incidents in Nigerian banks and 4) the relationship between critical incidents and brand-switching.

Critical incidents addresses in empirical terms (from observations and practical experience) how incidences are related to the customers’ overall satisfaction or dissatisfaction. However it was found that a negative incident has a negative impact on consumer behaviors. Positive incident has a positive impact on both consumer behavior and their overall customer satisfaction (Gremler 2004). The remainder of this paper contains a review of relevant literature, data and methodology, result, concluding remarks, references and biography of the authors

LITERATURE REVIEW

A critical incident is one particular historic event which from the customer’s point of view was satisfying or dissatisfying in the customer’s relationship with the supplier (Gremler, 2004). According to Edvardsson, and Strandik (2000), the main (implicit) assumption behind the interest in critical incidence in service research is that they may induce change in the customers-supplier relationship. In more general terms, it seems clear that one single encounter in one’s life can indeed have a lasting effect on one & sometimes even branch into new discovery of life (Banduura, 1983).

Roos, (2000), opined that a critical incident is an extraordinary event which are perceived or recalled negatively by customers before, during purchase or after consumption. Flangan, (1954) first used the term critical incidence technique by labeling a set of observational procedures for human behavior as critical incidence. Flangan (1954) defined critical incident as a set of procedures that systematically identifies behaviors that contributes to success or failure of individuals or organizations in specific situations. Bittner, and Tetreault (1990) described such an incident as critical when contributing either positively or negatively to an activity. Focusing on negative incidence as defined by Roos (2000), a negatively changed buying behavior can be triggered by these incidents. This implies that companies lose operating efficiency and future revenue streams as a result of of customers who reduce spending, reduce purchase frequency or switch to another supplier.

Since customer satisfaction emerged as a silent topic in marketing during the later part of the 1980s, researchers have made many attempts to identify determinants of satisfaction in empirical terms. Several methods have been employed in these efforts. The critical incident technique has become a popular method particularly in the service research industry (Gremler, 2004). The typical application is to: 1.) Ask customers to provide a qualitative account of one particular incidence (i.e. a very satisfying or dissatisfying incident) in relation to a supplier. 2.) The researcher classifies the resulting stories in categories reflecting different causes to dissatisfaction. It is assumed that such incident are critical not only in the sense that they can be recalled by the customers but the main rationale behind the critical incident is that it appears to induce change in the customer - supplier relationship (Edvardsson and Strandik 2000). In more general terms, it seems clear that no single encounter in one’s life can indeed have a lasting effect (Bandura, 1982.)

However, it seems clear that most critical incident researchers believed that a negative incident has a negative impact on overall satisfaction and that a positive incident has a positive impact on overall satisfaction. Thus critical incident researchers addressed how such incidents are related to customer overall satisfaction (Edvardsson and Strandik, 2000). Thus customer satisfaction is a key to every company wishing
to increase the value of customer assets and create a better business performance. To increase the value of
customer asset, customer satisfaction should be measured and managed

DATA AND METHODOLOGY

A multi-stage sampling technique was employed in the selection of location and respondents. In the first
stage, three banks in Umuahia were chosen purposively for this study due to its metropolitan nature and the
prevalence of branches of the banks in the city. The second stage involved a random selection of 150
respondents from the three banks, 50 respondents from each.

The research employed an exploratory survey method in data collection. Cross sectional data were collected
in July 2014 using a structured questionnaire. The sample size was determined using formula of Cochran
W.G. (1963). The study population covers an average number of bank customers on daily basis. A sample
of 150 respondents was conveniently sampled. A total of 150 questionnaires were distributed and 120 were
returned giving a response rate of 80%. Data were collected through a self- administered questionnaire and
analyzed using descriptive and inferential statistics. Spearman ranked correlation was used to test the
relationship between brand switching and critical incident.

The hypothesis states there is no positive and strong relationship between critical incident and brand
switching in consumer banking. The implicit function for the correlation is stated:

\[ p = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)} \]  

Where
\[ d_i = \text{difference in paired ranks} \]
\[ n = \text{number of cases} \]

RESULT AND DISCUSSION

First we examined demographic features of the respondents. Because the research is qualitative and
nonparametric data were involved, we examined the following variables: sex, education status and
occupation of the respondents. The demographic variables have a strong relationship with the customers’
judgment of incidents. Table 1 presents demographic characteristics of the respondents. Panel A shows that
51.67% of total respondents are female while 48.33% are male. Panel B indicates that 75% of respondents
earned a university education. Panel C reveals that 73.33% of the total respondents are still furthering their
educational pursuit while 26.67% are either working for the government or themselves.

Table 1: Demographic Characteristics of Respondents

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sex</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel A: Gender</td>
<td>Male</td>
<td>48.33</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>51.67</td>
</tr>
<tr>
<td>Panel B: Education</td>
<td>Primary</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>25.00</td>
</tr>
<tr>
<td></td>
<td>Tertiary</td>
<td>75.00</td>
</tr>
<tr>
<td>Panel C: Occupation</td>
<td>Student</td>
<td>73.33</td>
</tr>
<tr>
<td></td>
<td>Civil Servant/ Self Employed</td>
<td>26.67</td>
</tr>
</tbody>
</table>

Source: computed from research survey, 2014. This table shows demographic characteristics of the respondents. 48.33(male) and
51.67(female). Some, 25% of respondents had secondary education, 75% were university graduates. 73.33% of the total respondents were students,
while 26.67 were identified as self-employed.
Brand switching is a common phenomenon in the banking industry. The indices of brand switching investigated range from critical incidents, high cost, service (network) failure, and inconvenient location etc. Table 2 analyzed descriptive statistics of these brand switching variables. Column 1, shows the brand switching variables while Column 2, 3, 4 and 5 show the 4 point likert scale ranging from very high extent to very low extent.

The significance of the 4 point likert scale reposes on a high extent scale. The result shows that brand switching to a large extent is induced (40%) by critical incident, (31.67%) by service failure, (28.33%) and by high cost and inconvenient location respectively. Figure 1 shows that critical incident represented the highest bar on very high extent scale.

Table 2: Descriptive Statistics of Brand Switching Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Very High Extent</th>
<th>High Extent</th>
<th>Low Extent</th>
<th>Very Low Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Cost</td>
<td>34 (28.33)</td>
<td>56 (46.67)</td>
<td>22 (18.33)</td>
<td>8 (6.67)</td>
</tr>
<tr>
<td>Service Failure</td>
<td>38 (31.67)</td>
<td>46 (38.33)</td>
<td>26 (21.67)</td>
<td>10 (8.33)</td>
</tr>
<tr>
<td>Inconvenient Location</td>
<td>34 (28.33)</td>
<td>36 (30)</td>
<td>38 (31.67)</td>
<td>12 (30)</td>
</tr>
</tbody>
</table>

Source: computed from research survey, 2014. This table shows a descriptive analysis of four brand switching variables that were tested with a four point Likert Scale. The numbers in bracket are percentages. The result is significant at very high extent. Some 40% of total respondents agreed that to a very high extent, critical incident triggers brand switching behavior.

Figure 1: Bar Representation of Brand Switching Variables

The bar-graph shows the extent each of the brand-switching variables were indicated by respondents as causing brand-switching. The vertical axis shows percentages while the horizontal axis shows brand-switching variables. Critical incident among other variables was ranked the most significant under (the very high extent) impact.

We argue that a negative critical incident has negative impact on consumer behavior while a positive critical incident has a positive impact on both consumer behavior and overall customer satisfaction. The result of critical incident induced consumer behavior is presented in Figure 2. The result indicates that 19% of customers who experienced a negative critical incident brand switched while 25% brand switched with a
negative word of mouth. Some 56% of customers who encounter rough interface with service providers only complain and continue banking with the same firm. This indicates that 56% do not judge a critical incident elastic enough to guarantee brand switching.

Figure 2: Critical Incident Behavior

Source: computed from research survey, 2014. The pie chart contains information on critical behavior of respondents. The five different parts indicate responses on how the respondents would behave in the event of negative critical incident. In summary, 44% of the total customers that experienced critical incident will switch to other brands.

The result of the correlation coefficient analysis shown in Table 3 indicate there was a significant positive relationship between brand switching (dependent variable) and critical incident (independent variable). The null hypothesis that there is no strong positive relationship between brand switching and critical incident was rejected ($P > 0.05 = 0.063^{**}$) which is significant at 0.01%. The first column contains the type of correlation estimated. Column 2 shows the variables with which relationship is being estimated. Column 3 shows the correlation coefficients, the significant level and the sample size entered for estimation. Column 4 shows the outcomes of the analysis in terms of the correlation coefficient level and sample size of the data estimated.

Table 3: Nonparametric Correlations

<table>
<thead>
<tr>
<th></th>
<th>Brand Switching</th>
<th>Critical Incident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spearman’s rho</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brand switching</td>
<td>Correlation Coefficient</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.063*</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>120</td>
</tr>
<tr>
<td>Critical incident</td>
<td>Correlation Coefficient</td>
<td>0.063</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.665</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>120</td>
</tr>
</tbody>
</table>

This table shows the result of spearman’s rank correlation model. The first column contains the type of correlation estimated, column 2 shows the variables with which relationship is being estimated; column 3 shows the correlation coefficients, the significant level and the sample size entered for estimation. Column 4 shows the outcomes of the analysis in terms of the correlation coefficient level and sample size of the data estimated.

CONCLUDING COMMENTS

The study focused on brand switching in Nigerian banks. The study specifically focuses on evidence from critical incidents. The study examined: 1) relevant demographic characteristics of the respondents, 2) brand switching variables and extent of their significance to brand switching, 3) brand-switching behavior of the respondents towards critical incidents in Nigerian banks, and 4) the relationship between critical incident and brand-switching. The study was carried out in Abia State, Nigeria. Among money deposit banks in Abia State, 3 banks were randomly selected and 150 respondents sampled. About 80% of
structured questionnaires administered were returned. Descriptive statistics such as percentages, bar and pie charts as well as spearman’s rank correlation model were used in data analysis.

Results indicated that critical incident is more significant than other variables that cause brand-switching in Nigerian banks. There is also a significant and strong positive relationship between brand-switching and critical incidents. Socio-economic characteristics of respondents do not have any strong relationship with critical incident. Brand-switching is a function of many factors among which critical incident is the most significant at a very high extent scale. Also, a repeated negative incident from customers’ viewpoint is judged critical at the level of elasticity. That is, the level where the negative impact of the negative incident is considered higher than the value of the transaction, as judged by the customer. It is at this level that a repeated rough interface (critical incidents) can lead to brand-switching.

There was a knowledge gap between the researcher and most of the respondents. Most respondents did not understand the research instrument. Another important limitation is that most respondents were in a hurry to attend to our team and to fill our questionnaire. The researchers make the following recommendations: 1) employers and staff in the banking sector should consciously create positive incident incidents that will increase customer satisfaction, 2) customers should be educated on how and where to present their complaints and 3) that the employers should embrace customer-relationship management which could dissolve the intentions of brand-switching. We recommend that more empirical research should be done on critical incident behavior.

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EMPIRICAL EVIDENCE ON THE RELATIONSHIP BETWEEN TRADE OPENNESS AND ECONOMIC GROWTH

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ABSTRACT

This paper examines the impact of trade openness on economic growth using a new measure of trade openness proposed by Squalli and Wilson (2011). In contrast to the vast majority of the existing literature, the new measure of trade openness accounts for not only the country trade share of its GDP but also the relative size of the country’s trade compared to the world trade in a given year. Using this innovative way to measure openness, the current essay examines the impact of trade openness on economic growth. We use data set includes 182 countries and covers the period from 1971 to 2011. We employ the Common Correlated Effects Mean Group (CCEMG) estimator developed by Pesaran (2006) and applied Cavalcanti et al. (2011) which takes into consideration the heterogeneity nature of world countries.

JEL: F140

KEYWORDS: Trade Openness, Economic Growth, Common Correlated Effects Mean Group (CCEMG) Estimator

INTRODUCTION

The relationship between openness and the level of national growth is a highly debated topic in the empirical literature. Although some recent advances reinforce a positive impact of openness on economic growth, it is still in doubt how robust are these estimates. A possible reason for this is the lack of a clear definition of the trade openness and how to measure it. Most studies use, as a proxy for trade openness, the ratio of the sum of export and imports (both goods and services) divided by the GDP at constant or current prices, often called 'trade openness ratio'. Our intention in this paper is to address the relation between trade openness with a new measure and economic growth. The study, therefore contributes to the related growing literature on trade openness in different folds. First, it constructs and tests a new measure of trade openness. Second, the data set includes almost all countries in the world (182 countries) and covers the period from 1971 to 2011. Third, it takes into consideration the heterogeneity of the countries being examined, which has been ignored by most relevant literature. We use the Common Correlated Effects Mean Group (CCEMG) estimator to investigate the relationship and deal with the heterogeneity nature of world countries. The structure of the paper is as follows: section provides an overview of the related empirical work in the literature. Next section describes the data and methodology used in the study. The results are presented in the following section. The paper closes with some concluding comments.
LITERATURE REVIEW

Most of the empirical studies on the link between openness and growth acknowledge a positive relationship in spite of the methodologies and trade openness proxies being used. For instance, Wacziarg (2001) finds that trade openness has a positive and significant impact on economic growth in a panel of 57 countries over the period 1970-1989. Similarly, Irwin and Tervio (2002) even after controlling for endogeneity, find a positive relationship between openness and growth in the interwar and the post-war periods. Vamvakidis (2002) uses historical data for the period 1870-1990 and concludes that the positive openness-growth relationship is rather a recent phenomenon, mainly driven by the world trade expansion. No significant positive relationship was found for the period before 1970, whilst the period 1970-1990 showed a significant positive effect of trade openness on economic growth. Furthermore, Salinas and Aksoy (2006) apply multivariate fixed effects estimations to examine the link during pre and post trade liberalisation periods and conclude that the post-liberalisation period saw an increase in the economic growth of about 1.2 percentage points higher than the pre-liberalisation period. Brunner (2003) uses a dynamic panel data model to study the impact of trade openness on the level of national income and growth for a sample of 125 countries for the period 1960-1992. He concludes that trade openness has a significant large effect on the level of national income, but small and non-robust effect on income growth.

Chang et al. (2009) draw a similar conclusion using data for 22 developed and 60 developing countries over the period 1960-2000. The authors also reveal that the positive association can be further significantly enhanced, if trade liberalisation is combined with flexible labour markets stable inflation rates and improved public infrastructure. Addressing the potential endogeneity of trade openness, Lee et al. (2004) investigate the relationship for a sample of 100 countries during the period of 1961 to 2000. The authors conclude that trade openness has an increased economic growth impact for these countries, although the effect is found to be small in magnitude. A more recent study by Sarkar (2008) employs a panel-data from 51 less developed countries LDCs for the period 1981-2002 and concludes that countries with higher trade shares tended to experience a higher real growth. Villaverde and Maza (2011), using globalisation as an indication of trade openness, also find a positive relationship over the period 1970-2005.

To overcome the shortcomings related to the choice of the econometric methodology especially when the sample sizes are small, several empirical works have used panel approaches, which are cited to provide more reliable estimates than the time series and cross-section regressions do. Within this context, Felbermayr (2005) examines the link between incomes per capita and trade openness measured by ‘trade openness ratio’ based on Blundell and Bond’s system-Generalized Method of Moments (GMM) method. The results indicate that openness strongly influences income for the considered set of countries. The emerging conclusion from the reviewed studies is that trade tends to have a positive impact on income. A few papers doubt about the relationship between trade openness, growth, and development, and in some cases indirect impact has been found, citing productivity or investment as a prerequisite for economic development. However, most of these studies do not capture the potential heterogeneity in the relationship between trade and income across countries, assuming implicitly that the effect of trade on income is the same for all countries.

DATA AND METHODOLOGY

To perform a broad panel analysis of a large number of countries and over a long period, we use a balanced annual panel dataset containing 182 countries over the period 1971-2010. Our analysis is based on two variables extracted from the Penn World Table 8.0 provided by Heston et al. (2013). Trade openness is measured by the CTS as proposed by SW(2011). The per capita GDP measured in constant prices and in international dollar per person. In order to examine the growth-openness nexus, the current study follows an augmented neoclassical production function, which is adopted in similar studies such as Frankel
and Romer (1999), Thomas G.(2012), Herzer, D. (2013) and Sakyi D. et. al. (2012). In this context, we
employ a bivariate model in which we regress the per capita growth of income on trade openness measured
by the CTS. We start off with the following equation.

\[ \ln Y_{it} = \alpha_i + \beta \ln x_{it} + \epsilon_{it} \]  

(1)

Where \( t=1,2…T \) and \( i=1,2…N \), \( Y \) real gross domestic product per capita, \( x \) denotes openness trade
measured by the CTS, both variables are log-transformed, \( \alpha_i \) the country-specific fixed effects, \( \beta \)
parameter related to trade openness and \( \epsilon_{it} \) an error term. Two estimation issues arise from the above
model, namely parameter heterogeneity and cross-section dependence. In order to cope with these
econometric issues, Pesaran (2006) proposed a new technique called Common Correlated Effects Mean
Group (CCEMG). The CCEMG assumes random slope coefficients, which are independent and identically
deviate from their respective averages. According to Pesaran (2006), the core idea here is to filter the
individual specific regressors with the help of cross-section aggregates and as the number of cross sections
goes to infinity the differential effects of unobserved common factors will be trivial. To elaborate more on
the CCEMG estimator, consider the following linear heterogeneous panel specification:

\[ y_{it} = \alpha_i + \beta_i x_{it} + \epsilon_{it} \]  

(2)

Where \( \beta_i \) is country-specific parameter for country \( i \). In order to address the cross-sectional dependencies,
Pesaran (2006) assumes that the error term in Eq. (2) follows a multifactor structure defined as follows.

\[ \epsilon_{it} = \gamma_i f_t + u_{it} \]  

(3)

Where \( f_t \) is a \( m \times 1 \) vector of unobserved common effects, which are allowed to be serially correlated. In
addition, Kapetanios et al., 2011 show that the \( f_t \) in the above equation could be stationary or non-
stationary. They could even be correlated with trade openness, see Holly et al., 2010; Cavalcanti et al., 2011.
The \( u_{it} \) term represents a country specific error and allowed to be weekly dependent across \( i \) and serially
correlated over \( t \). Since \( x_{it} \) are assumed to be correlated with unobserved effects \( f_t \), it follows that

\[ x_{it} = \eta_i + \xi_i f_t + \upsilon_{it} \]  

(4)

Where \( \xi_i \) is a \( k \times 1 \) vector of factor loadings, and \( \upsilon_{it} \) is the error term, which is assumed to be identically
and distributed independently of \( f_t \)and\( u_{it} \). Finally, to obtain the CCEMG, one needs to have \( N \) country
regression equations, each of which contains the cross-section average terms for \( y \) and \( x \) as follows.

\[ y_{it} = \alpha_i + \beta_i x_{it} + \beta_0 y_{it} + \beta_1 x_{it} + \epsilon_{it} \]  

(5)

Where \( y_{it} \) and \( x_{it} \) are the cross-sectional averages and only serve as proxies for the common factors and
may not have any interpretable meaning (see Pesaran, 2006). The coefficient of interest is computed as the
simple average of the \( N \) countries:

\[ \hat{\beta}_{\text{CCEMG}} = N^{-1} \sum_{i=1}^{N} \beta_i \]  

(6)

Thus, our estimator is just the average value of the country-specific slopes, which reflects the long-run
relationship between trade openness and per capita income. According to Pesaran (2006), the short-run
dynamics and their adjustment to the long run across countries are accommodated through the error term \( \epsilon_{it} \),
which has a multifactor error structure as explained in Eq (3). Our model specification in Eq(2) can now be
expressed with the multifactor error structure as follows:
\[ \ln Y_{it} = \alpha_i + \beta_i \ln \text{OPEN}_{it} + b_{i0} \ln Y_{it} + b_{i1} \ln \text{OPEN}_{it} + \varepsilon_{it} \]  
(7)

Where \( \ln Y_{it} \) and \( \ln \text{OPEN}_{it} \) are proxies for the unobserved common factors.

**Measuring Trade Openness**

The new trade measure, which this paper uses to address the relation between trade openness and economic growth, is the Composite Trade Share CTS, which is introduced by Squalli and Wilson (2011). The CTS include more information about the country’s contribution to the global economy and its influential impact on the world economy. That is, the current study constructs and tests the CTS as a new measure of trade openness, and uses such a measure to re-examine the trade-growth nexus. The CTS can be presented as follows:

\[ \text{CTS}_i = \frac{(X+M)_i}{\sum_{j=1}^{n}(X+M)_j} \frac{(X+M)_i}{GDP_i} \]  
(8)

The innovation in the CTS measure of trade openness arises from the fact that coherently incorporates two dimensions of a country’s ties with the outside world. In particular, SW have considered not only the country’s trade to GDP ratio but also its substantial interaction and interconnectedness with the rest of the world. More specifically, the CST includes two factors; the proportion of a given country’s total income generated by international trade and the relative importance of that country’s contribution in the world trade. According to SW, the CTS, in contradiction with the conventional measures of trade openness is able to capture the actual, rather than potential, trade flows.

**RESULTS**

For the comparison of the results, we also compute the traditional mean group (MG) estimates of Eq. (2), which does not take account of cross-section dependence by assuming independent errors. Table (1) contains the results from CCEMG estimation accounting for both heterogeneity and cross section dependence present in the data. As the table shows these results indicate that trade openness has a significant and positive impact on GDP per capita. According to the results presented in Table (1), the long-run relationship between trade openness and the level of income is positive and highly significant in both estimators. However, we observe, on the one hand, that the mean coefficient \( \beta \) is much bigger in the CCEMG estimate than in the MG.

Table(1): Estimates of the Long Run Impact of OPENNESS on GDP Per Capita Using Panel Heterogeneous Estimator MG And CCEMG

<table>
<thead>
<tr>
<th>Dependent Variable : GDP Per Capita</th>
<th>MG</th>
<th>MG</th>
<th>CCEMG</th>
<th>CCEMG</th>
</tr>
</thead>
<tbody>
<tr>
<td>openness</td>
<td>0.03**</td>
<td>0.02**</td>
<td>0.415***</td>
<td>0.403***</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.01)</td>
<td>(0.021)</td>
<td>(0.02)</td>
</tr>
<tr>
<td>Trend</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>No. of Obs</td>
<td>7462</td>
<td>7462</td>
<td>7462</td>
<td>7462</td>
</tr>
<tr>
<td>No. of countries</td>
<td>182</td>
<td>182</td>
<td>182</td>
<td>182</td>
</tr>
<tr>
<td>CDtest statistic</td>
<td>151.4***</td>
<td>18.23***</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This table shows the long run impact of trade openness on GDP per capita using panel heterogeneous estimator MG and CCEMG. the coefficient that estimated by CCEMG is positive and statistically significant. An increase in the CTS on average, lead to an increase in per capita income about 0.41 per cent. Note: Standard errors are reported in parenthesis. ***,***, denote rejection of the null hypothesis at the 1%, 5% and 10% significance level, respectively. The CD test statistics are Pesaran (2004) CD test on the residuals of MG and CCEMG estimates.
Moreover, the CCEMG estimator has led to a significant reduction of cross-section dependence inherent in Eq. (2), and thus provides us with the true mean coefficient $\beta$. According to Table (1), the coefficient of openness that estimated by CCEMG is positive and statistically significant, which means a one percent increase in the CTS on average, a statistically significant increase in per capita income about 0.41 per cent.

**CONCLUSION**

The present paper investigates the dynamic relationship between Trade Openness and economic growth of 182 countries over the period 1970-2010. A new measure of trade openness is constructed following the approach developed by Squalli and Wilson (2011). For estimation purposes, we have employed heterogeneous panel cointegration techniques namely Common Correlated Effects Mean Group (CCEMG) estimator to investigate the relationship and deal with the heterogeneity nature of world countries. This estimator is robust in the presence of non-stationarity, endogeneity and cross-section dependence, which offers more reliable results than conventional approaches. Employing data for 182 developed and developing countries over the period from 1971-2010, we found that trade has, on average, a statistically significant effect on income. Although our estimation strategy accounts for cross-country differences, it might be informative if future research examines the trade-growth nexus by grouping countries according to their structural characteristics; such as oil exporter compared to oil importer countries.

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THE ACCOUNTING EQUATION INEQUALITY: A SET THEORY APPROACH
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ABSTRACT

The basics of financial accounting in the balance sheet and the accounting equation are revisited from the viewpoint of axiomatic set theory and predicate logic. The conceptual distinction between assets and claims on the assets are pointed out; next, it follows an application of the axioms of the theory. By a combination of axioms, this application leads to obtain two sets of capital units, which contains assets and claims (Liabilities plus Owners’ Equity) on the assets, respectively. These sets are properly built, according to the use of the axioms; they contain all the lowest level items of the financial statements that still have financial meaning in the balance sheet. An analysis of the equality between these sets was applied to test the equality of the assets to the union of liabilities and equity. The analysis determined that these sets were not equal and as a conclusion assets are not equal to liabilities plus equity. This inequality is interpreted within the restrictions of the application of the set theory to financial data and algebraic sum. Nevertheless, the particular case where the accounting equation holds is described; however, this case has no financial meaning.

JEL: G3, M2, M4

KEYWORDS: Corporate Finances, Financial Accounting, Balance Sheet, Accounting Equation, Set Theory

INTRODUCTION

The balance sheet is based on the equality of assets to liabilities plus owners’ equity. This equation is the fundamentals of the financial statements and analysts make significant efforts to classify items and fit the equation. However, it is well-known that different views in financial accounting analysis lead to different financial decision-making as it happens regarding conservatism accounting (Wang, 2013). According to Wang, conservatism involves the prudence principle and its application results in asymmetric different timeliness for recognizing earnings and losses. Therefore, it shows the influence of the figures significance; subjectivity is associated with numbers and changes the financial operations.

Accounting report analysis also contains different approaches. The semiotic linguistic theory analyzes the accounting reports as texts rather than from an economic viewpoint (Macintosh and Baker, 2002). Macintosh and Baker use an approach based on the notion of heteroglossic novel, where accounting has a representational nature; this approach uses the perspective of the literary theory in the analysis of accounting data. Accordingly, it calls for a conversational rather than a monologic process of accounting and, again, the diverse interpretations of accounting information are significant.

Chaos and complexity theories provide a different approach to financial statements and financial accounting. Lewin (1999) explored the implications of complexity in management studies, and Richardson (2008) pointed out that the metaphorical language is a characteristic of the sciences of complexity in management. According to the use of complexity theory in management and corporate finances, financial statements are not a fixed structure but a complex dynamic system. This system comprises many processes
and various subsystems located at different levels, interacting with each other and resulting in a proper fit (Juárez, 2013). Juárez (2013) described how the use of belief logic (see belief logic in Smullyan, 1986) is implicit in the management discussion & analysis section and notes of the financial statements. The manner that the analyst communicates the findings in these sections is relevant; it is a communicative act where results depend on the type of reasoning used. In this line, belief and paraconsistent logics are tools that help in the analysis and conclusion of these sections (see Juárez, 2012, 2013, 2014).

Historically, it has been an interest in reviewing the foundations of financial accounting; in 1967, Sterling discussed the theoretical basis of accounting. In 1976, Wells provided an outstanding analysis of the developments and anomalies in accounting thought and, later on, Bauman (1996) explored the theoretical framework in fundamental analysis. Still later, Christensen (2010) discussed the conceptual frameworks of accounting from an information perspective.

Therefore, the basis of financial accounting change continuously and the quest for well-established foundations has no end. The possibilities of accounting equation have also been explored (see Lipkin, 1959, Nicol, 1968). However, the accounting equation is always assumed to be true and never questioned.

Usually, the bookkeeper operations and a set of rules guarantee that the accounting equation holds. While this is worthy, a rationale must exist that explain the veracity of the equation and allows reviewing it. Consequently, this research analyzes the justification for the accounting equation.

The remainder of the paper begins with a review of the relevant literature. Next, the paper provides a description of the data and methodology used. The following section presents analytical results. Finally, the paper closes with some concluding comments.

LITERATURE REVIEW

Few works introducing logic and axiomatic set theories into accounting have been done. No doubt, Mattessich (1957, 1964) is one of the first and great authors looking at the accounting system as a logical system; he delivered a consistent theory and formalization of the language of accounting. The developments made by Mattesich were impressive, and he redefined accounting with logical and theoretical research foundations.

Carlson and Lamb’s system (1981) is complete and profound in their use of the axiomatic theory, giving a right direction to conduct research on the field. They point out the fact that Mattesich system uses set theory while they use predicate logic, but also that similarities exist between the two systems.

Carlson and Lamb (1981) state that predicate logic is well suited to accounting and the way accounting theory works. They introduce a well-formed system with axioms, inference rules, and theorems. Besides, their methodology includes a nontechnical language, easy to understand, to characterize the axiomatic system. In this system, references to the duality of accounting exist, recognizing the fact that someone exerts a claim on every potential asset inflow. The system also has mechanisms to preserve the accounting equation; i.e. an asset inflow is a debit to the asset account and a credit to a liability or equity account.

Moreover, Carlson and Lamb (1981 introduce some postulates to deduce accounting equation. The equation is defined as the equality of the valuation of the class of assets to the valuation of the class of liabilities plus the valuation of the class of owners’ equity. Nevertheless, this rationale for the equation requires the assumption that every time an inflow in assets exists there is recognition in a liability or equity account. Therefore, by these operations, the equality is always maintained.
The application of formal logic to financial accounting leads to different financial statement analysis, with an impact on financial decision-making. The approach of chaos and complexity allows introducing propositional logic, belief logic, circumscription logic and dialogic in financial statements (Juárez, 2013). According to this perspective, transactions on the financial statements are what guarantee that the accounting equation holds; however, contradictions exist in this type of reasoning that gives support to the accounting equation.

As it was stated (see Juárez, 2012, 2013, 2014), several logics coexist in the financial statements analysis. These logics are the following: a) default reasoning; it allows allocating a capital to an item in financial statements unless a counter-example exists; b) abductive reasoning; it justifies assigning a capital to an item whenever a reason exists to do so; c) circumscription logic (see McCarthy, 1980); it lets to enter a new explanation that contributes to solve the problem; d) paraconsistent logic; it focuses on the existent contradiction when an asset valuation is also a debt or equity; and e) the circularity of dialogic (see Morin, 2007) that leads to circularly link consequences to causes. Within this landscape, the complexity of financial statements makes it necessary to review some of the accounting equation foundations.

Based on the above arguments, the aim of this research is not the formulation of a new axiomatic theory about the foundations of financial accounting because good descriptions have already been provided in the literature. This investigation focuses on the logical truth of the accounting equation, which is the basis of the balance sheet and financial accounting.

DATA AND METHODOLOGY

The method used is objective, rationalistic, deductive and analytical; it uses predicate logic and axiomatic set theory to derive arguments and conclusions with the rationales of this logical and theoretical framework.

The axiomatic set theory of Zermelo-Fraenkel (Zermelo, 2004, original 1908), which is a widely accepted framework in this field, uses predicate logic to postulate its axioms. This theory comprises a set of well-defined axioms that determine the logical operations allowed applying to sets. The theory refers only to sets, so the elements of a set are always sets; it includes the axiom of extensionality, axiom of regularity, axiom of specification, axiom of pairing, axiom of union, axiom schema of replacement, axiom of infinity, axiom of power set, and axiom of choice.

Zermelo created this system because advances in set theory were not accompanied by a proper definition of set (Kragh, 2001). Some logical paradoxes resulted in an intolerable situation to the very notion of set, which is not simply a collection of objects, but objects according to an axiomatic system (Kragh, 2001). The system created by Zermelo remained as the most popular and accepted theory of sets. Fraenkel did some adjustments to the theory and introduced the replacement axiom, resulting in the Zermelo-Fraenkel set theory.

To test the equality of the accounting equation, the set union is assumed to be equivalent to the algebraic sum (Kragh, 2001). The fact that set union and algebraic sum have different properties does not affect the rationale provided.

RESULTS AND DISCUSSION

The accounting equation is

$$\text{Assets (}A\text{)} = \text{Liabilities (}L\text{)} + \text{Owners’ Equity (}E\text{)}$$  \hspace{1cm} (1)
In the equation, financial resources are allocated into two groups; one of them is assets, and the other one is liability plus owners’ equity.

Any capital unit \( \{u_i\} \) (whatever it is) is an asset, liability or owners’ equity, based on the financial definition of what an asset, liability or owners’ equity is. Financial definitions can be of any type; they are of no particular interest here, and the only requirement is that they agree with the standards in the academic field; so no new definitions are needed. Besides, any pair of capital units are different, i.e. \( \{u_i\} \) and \( \{u_j\} \) are different, even having the same value. In set theory, it is necessary to make explicit this difference; in case these capital units were not different, a set having several capital units, would be the same as a set having just one.

The specification axiom allows creating subsets by a formula \( \phi \); this axiom creates a subset with all its elements (sets) having the property defined by \( \phi \). The formula \( \phi \) allows for identifying a subset \( y \), such as it contains every element \( x \) of the set \( z \) with the property described in the formula \( \phi \). This formula could be

\[
\phi_A: \ u_A \ is \ a \ company \ asset
\]

where \( u_A \) is a capital unit.

The formula is also applied to liabilities and owners’ equity, creating the subsets \( A, L \) and \( E \). They are subsets because are part of a financial system, and the financial statements of a company or other entity are subsets in this system. As far as all the financial statements have the same theoretical structure in the financial system, the specific company has no interest in the analysis.

The application of these definitions and axiom result in the sets \( A, L \) and \( E \). This classification is what the analyst uses when assigning capital transactions to the financial statements. These sets comprise all the financial resources of the organization. The formula \( \phi \) applies to all the sets in the financial statements, resulting in all the subsets or items in the financial statements.

The assets of the organization have the same value than the claims on the assets. Nevertheless, the conceptual distinction between assets and claims, along with the fact that financial statements are classified, make it necessary to check whether the equality proposed in the accounting equation is real. This conceptual distinction is what make it possible to define the accounting equation; in the absence of this distinction, it would not be necessary to verify that assets are equal to liabilities plus owners’ equity.

The structure of financial statements needs defining it as a structure of sets and subsets. The Zermelo-Fraenkel set theory allows defining a subset as that whose elements are also elements of another set. Accordingly if a set \( z \) is a subset of \( x \) and \( x \) is a subset of a set \( y \) then \( z \) is a subset of \( y \). Therefore, and using a simplified structure, the set \( A \) comprises the subsets current assets \( A_c \) and non-current assets \( A_{nc} \). Current assets \( A_c \) comprise cash \( A_{cc} \) and accounts receivable \( A_{car} \), while non-current assets \( A_{nc} \) comprise long-term investments \( A_{nctis} \), property, plant and equipment \( A_{ncppe} \) and intangible assets \( A_{ncia} \).

In the same manner, the set \( L \) contains different subsets, such as current liabilities \( L_c \) and non-current liabilities \( L_{nc} \). Current liabilities \( L_c \) includes, in turn, other sets such as accounts payable \( L_{cap} \) and unearned revenues \( L_{cur} \), while non-current liabilities \( L_{nc} \) include the set mortgage payable \( L_{ncmp} \) and notes payable \( L_{ncnp} \). The set owners’ equity \( E \) contains issued capital \( E_{ic} \), common stocks \( E_{cs} \) and retained earnings \( E_{re} \).

Another application of the specification axiom with the formula \( \phi_c \) is

\[
\phi_C: \ u_C \ is \ a \ claim \ on \ a \ company \ asset
\]
It results in another set $C$ containing all the claims made on the assets of the company. This set $C$ contains the subset $L$ and $E$, and the elements of $L$ and $E$ are elements of $C$.

The axiom of union states that the union of sets is a set that contains the elements of the elements of another set. Therefore, if a set $X$ contains several subsets $z$ and these elements contain several subsets $w$, then the union of the elements $w$ of the subsets $z$ of the set $X$, is another set $Y$.

According to the axiom of union, the set $L_u$ consists in the union of all of the liabilities individual elements or subsets. In this way, the set $L_u$ comprises all the liabilities of the organization. By the axiom of specification, this set is included in $C$.

Then, a new set can be defined, the set $C_u$, which is the union of $L_u$ and $E$; this new set comprise all the elements that are claims on the assets. These elements contain capital units grouped in categories with financial meaning; these categories are the items in the financial statements. Applying the same procedure to the assets, the set $A_u$ is the union of all of the elements of $A_c$ and $A_{nc}$. The elements of $A_u$ are those elements that still keep financial meaning. These elements contain just capital units.

As a result of this previous operations on sets, there are two sets $A_u$ and $C_u$, and these sets contain all the lowest level items in the financial statements that still have financial meaning. It is so because these items (or elements of $A_u$ and $C_u$) have a proper item name in the financial statements. The elements of these sets (items) are the single capital units $\{u_i\}$. Accordingly, the sets $A_u$ and $C_u$ contain subsets that comprise sets of capital units; nevertheless, the subsets are not the same in $A_u$ and $C_u$, because the classified financial statements do not have the same items in assets and liabilities or owners’ equity.

The truth of the accounting equation is analyzed by comparing the sets $A_u$ and $C_u$. Thus the quality to test is

$$A = L \cup E$$

(4)

Successive applications of the set theory axioms, the union $L \cup E$, and the union of the subsets $A_i$ of $A$, resulted in two sets $A_u$ and $C_u$; each of them has the classified capital units of the assets and claims on the assets, respectively. Accordingly, the equation is interpreted as the equality of these sets.

In Zermelo-Fraenkel set theory, the equality of two sets is defined by the axiom of extensionality. According to this axiom, for two sets to be equal they need to have the same elements or subsets. Therefore, the set $x$ would be equal to the set $y$ if for all the subsets $z$, whenever $z$ is a subset of $x$ then $z$ is a subset of $y$, and whenever $z$ is a subset of $y$ then $z$ is a subset of $x$. Only under these conditions, a set $x$ is equal to $y$.

Translating that to the formulation of the accounting equation in the set theory, it would mean that the subsets of $C_u$ are equal to the subsets of $A_u$, and they would have the same elements. Applying the axiom of extensionality to the subsets $A_i$ of $A_u$, and the subsets $C_i$ of $C_u$, the subsets $C_i$ must be equal to the subsets $A_i$, and all of the capital units $\{u_i\}$ in a single set $C_i$ are in a unique set $A_i$. In other words, there must a subset $A_i$ of $A_u$ identical to a subset $C_i$ of $C_u$ and all of the subsets $C_i$ must have a corresponding set $A_i$.

However, the final structure of the financial statements, obtained by the set operations, still keeps financial meaning, and the capital units are classified into the original items of the financial statements. The applications of the Zermelo-Fraenkel set theory axioms resulted in a lowest level item categories, but still they are the original items by the financial classification. The financial operations of a company do not take into account that every capital unit $\{u_i\}$ in an item $C_i$ must be located in particular $A_i$. The capital of the company moves to different items $A_i$ depending on the organization needs.
Therefore, the capital units of each subset in \( C_u \) are spread over different subsets in \( A_u \). The organization does not allocate the capital of a subset of \( C_u \) to a subset of \( A_u \), but it distributes it among all possible types of assets and, at least, it exists a subset \( C_i \) of \( C_u \), such as its elements spreads over several subsets of \( A_u \). In the same sense, the specification axiom allows identifying capital units in the subsets \( A_i \) of \( A_u \) included in a \( C_i \) of \( C_u \). By the application of this axiom, it is found that the subsets of \( A_u \) does not agree with the subsets of \( C_u \). The axiom can use the formula

\[ \phi = \text{elements } \{u_i\} \text{ of a set } A_i \text{ that are also members of a particular } C_i \]  

(5)

The application of this axiom with this formula will restrict the elements \( \{u_i\} \) of a new set called \( A_{ic} \) to those \( \{u_i\} \) of \( A_i \) that are members of a given \( C_i \). Then, by the axiom of extensionality, in case of \( A_u = C_u \), it should be that \( A_{ic} = A_i \). It means that all of the elements of the set \( A_i \) are in \( A_{ic} \) because all of them are in a unique \( C_i \). However, this is not the case and \( A_i \neq A_{ic} \).

According to these rationales,

\[ A_u \neq C_u \]  

(6)

and

\[ A_u \neq L_u \cup E \]  

(7)

In a more general formulation

\[ A \neq L \cup E \]  

(8)

Alternatively, assuming the equivalence between the set union and algebraic sum

\[ A \neq L + E \]  

(9)

However, a special case exists that makes the equality of the equation true.

A new application of the axiom of the union to the sets \( A_u \) and \( C_u \) would result in sets \( A_{uu} \) and \( C_{uu} \). The set \( A_{uu} \) has the elements of the subsets of \( A_u \), i.e all the single capital unit sets \( \{u_i\} \) of every \( A_i \). In the same manner the set \( C_{uu} \) has the elements of the subsets of \( C_u \), i.e. all the single capital unit sets \( \{u_i\} \) of every \( C_i \). Applying the axiom of extensionality to the sets \( A_{uu} \) and \( C_{uu} \), it is easy to see that these sets are equal because all the capital units are in both of them. Accordingly

\[ A_{uu} = C_{uu} \]  

(10)

This result would mean that assets \( A \) are equal to claims (\( L \) plus \( E \)) on the assets.

\[ A = C \]  

(11)

In general, it could be said

\[ A = L + E \]  

(12)

However, this solution is trivial and has no financial meaning as it is a comparison of just amounts of capital that are equal because they are the same capital. Finally, it must be noted that the inequality of the accounting equation was determined by breaking the structure of the financial statements into its smallest
parts with financial meaning. Nevertheless, a rebuilding of this structure to higher levels would lead to the same result; in no other levels it is found a set equality.

CONCLUDING COMMENTS

According to the result, when using items with financial meaning, the accounting equation is an inequality. The result needs to be understood within the restriction of the set theory when applied to algebraic operations.

It has been pointed out that the union of two sets is equal to the sum (Kragh, 2001). However, the properties of the union of sets are not equal to those of the algebraic sum. Nevertheless, although the algebraic sum also has a formulation in the set theory, it was not introduced here. The analysis focused on the set union, which can be considered similar to the algebraic sum, in some way. The application of the axiomatic set theory along with predicate logic led to the conclusion that the accounting equation is an inequality. Even with the restrictions of the method, this finding has some implications for the foundations of the balance sheet and financial accounting.

This result requires more research to be conclusive. However, it is part of a research project in corporate finances, where the analysis of the foundations of financial accounting and, specifically, the accounting equation, has several approaches. These methods include the application of the axiomatic set theory, predicate logic and other types of logics, along with different forms of mathematical analysis. All of them led to similar results.

REFERENCES


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