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EVIDENCE ON THE EFFECT OF FINANCIAL DISTRESS ON CORPORATE ORGANIZATIONAL STRUCTURE FROM A MANAGERIAL QUALIFICATIONS PERSPECTIVE

Sergiy Rakhmayil, Ryerson University

ABSTRACT

This paper introduces a managerial skills dimension into analysis of corporate financial distress and corporate restructuring. We use an ordered logit model to examine how manager qualifications affect whether a company declares bankruptcy, is liquidated or reorganized, and how different forms of organizational structure emerge after companies experience distress. The current paper uncovers additional evidence that manager qualifications are important during financial distress. However, we determine that managerial skills are not panacea and beyond a certain limit no talent and skills can save a failing firm from bankruptcy.

JEL: G33, G34

KEYWORDS: Bankruptcy, Manager Qualifications, Restructuring

INTRODUCTION

This paper introduces a managerial skills dimension into analysis of corporate financial distress and corporate restructuring. We use an ordered logit model to examine how different forms of organizational structure arise after companies experience distress. Our sample companies were on the Fortune 500 list before the financial crisis in 2008. We examine corporations that experienced distress and underwent corporate restructuring as a way of coping with financial turmoil, and evaluate whether skills and experiences of company CEOs are related to the way firms emerged from distress. We discover that that the likelihood of corporate survival as independent going concern is associated with good education and with prior experience of enduring through financial distress. If a company faces distress, it also faces different possibilities such as bankruptcy and liquidation, reorganization, being a takeover target, taking over a different company, et cetera. Some of these possibilities will be detrimental for corporate survival as going concern, for example liquidation or being a takeover target. Other possibilities allow for continued independence, for example Chapter 11 reorganization or acting as a raider and taking over another corporation. We rank these possibilities based on continued organizational independence from the least preferred choice of liquidation to the most preferred choice of not filing for bankruptcy and taking over another firm. Next, we measure managerial skills and abilities by several variables that describe employment tenure, schooling, and prior experiences.

Employment tenure is measured by age, which proxies for general experience, and by firm tenure. Schooling is measured by dummy variables that show whether a given manager graduated from top 100 universities in Times Higher Education list, and whether the manager has an MBA or law degree. Prior experiences are measured by dummy variables that show whether a manager has led a company through unprecedented growth, through corporate restructuring, or through financial distress. Finally, we use an ordered logit model and examine if managerial characteristics affect choices of post-distress organizational

structure, controlling for financial conditions and governance structure. The literature holds some controversy regarding the effect of managerial characteristics and firm performance. Gottesman and Morey (2010) find no evidence that qualifications improve firm performance, Perez-Gonzalez (2006) discover negative effects, and Chemmanur and Paeglis (2005) and Rakhmayil and Yüce (2013) find positive effects of education on firm performance. Additionally, Lin et al. (2011), Custódio and Metzger (2013) and others document effects of prior work experiences on performance. The likelihood of survival through financial distress was initially assessed through financial performance only; see for example Beaver (1966) or Altman (1968). Later research, for example Altman et al. (2010), Tinoco and Wilson (2013), Filipe et al. (2016) introduced more dimensions into analysis, such as prior firm history, past rates of growth, and economic conditions. A recent wave of literature including Leverty and Grace (2012), Andreou et al. (2017), Cornaggia et al. (2017) adds managerial characteristics to this mix.

The current paper extends this literature and uncovers more evidence that manager qualifications are important during financial distress. However, we show that managerial skills are not panacea and beyond a certain limit no talent and skills can save a failing firm from bankruptcy. We follow companies from the 2008 Fortune 500 list that experienced financial distress during the 2008 financial crisis, and examine how manager qualifications influence the outcomes. Our evidence suggests that better manager qualification is a positive factor for firm survival. Next, we conduct scenario analysis using our empirical model, and show how several aspects of manager qualification affect the hypothetical outcome of financial distress. Based on our scenario analysis, the crucial factors for keeping companies afloat are prior relevant managerial experience and good education. However, it appears there is a limit to which these qualification factors are relevant for staying out of liquidation, and companies in very bad financial condition cannot be saved regardless of manager qualification. This paper is organized as follows. The next section presents literature review, then we describe the dataset, reveal the methodology, and present estimation results. Next, we present scenario analysis, which is followed by the conclusion.

LITERATURE REVIEW

Earlier literature did not consider managerial qualifications as a factor for corporate performance or corporate survival, and focused on financial performance data. On the other hand, modern economic theory suggests that education and skills augment labour and we should expect that improved qualifications should lead to higher productivity. However, when researcher started to focus on this issue, some surprising results surfaced. Pfeffer and Fong (2002) and Gottesman and Morey (2010) examine the relationship between managerial background and firm performance, and find no evidence that manager education is a relevant factor for influencing career success or firm performance. The authors argue this was a signal that business education was not relevant to the problems faced by businesses at the time. These results add to the ongoing controversy, especially considering Perez-Gonzalez (2006) who discovered the detrimental effect of lack of good education on firm performance, and Maxam et al (2006) who found negative effects of education on mutual fund results. Next, Malmendier and Tate (2009) discover that media-induced superstar status is not a signal of managerial quality. Their evidence points that award-winning CEOs earn more money for themselves and spend time on unrelated activities such as writing books, and all this occurs while their firms underperform. Additionally, a negative effect of managerial indiscretion on firm performance is documented by Cline et al (2018). Next, many recent papers do find a positive effect of education and experience on performance. Chemmanur and Paeglis (2005) document such effects for firms undergoing IPO. They find evidence that managers with better education and more reputable background and experience are better able to convey value of IPO firms to investors. Rakhmayil and Yüce (2008, 2013) find evidence that better educated executives use greater leverage and achieve higher firm value, measured by Tobin's Q. Terviö (2008) and Baranchuk et al. (2011) offer theories how managerial abilities are related to firm value and offer sound arguments that better able managers should increase firm performance.

Recent papers try to measure managerial ability not only by education and degrees, but also using various indicators of interpersonal characteristics. Kaplan et al. (2012) find evidence that firm performance is positively associated with various measures of managerial skills and abilities. Falato et al. (2015) find that managers with better credentials are associated with better performance and greater compensation. Choi et al. (2015) find a positive association between a measure of managerial ability and cash flows.

Another indicator of managerial ability is prior experience. Güner et al. (2008) study how corporate directors affect M&A deals and find that directors with investment banking experience are associated with deals that have access to greater financing. Chang et a. (2010) study CEO departures and find that stock market reaction was more negative following departures of CEOs where predeparture firm performance was greater. Lin et al. (2011) examine the effect of prior military service for CEOs whose companies engage in mergers and acquisition. They discover that firms run by CEOs with prior experience in the military achieve greater financial results and better corporate governance. Custódio and Metzger (2013) find evidence that relevant target industry experience for acquirer CEOs results in greater acquisition returns. Custódio et al. (2013) study how lifetime work experience affects CEO pay, and uncover evidence that CEO pay is higher for managers with greater general lifetime managerial experience. Custódio and Metzger (2014) find evidence that employment histories of CEOs carry weight in formulating corporate policies for their respective companies. Thus, the current literature suggests several ways to assess managerial ability, and most recent evidence points that more able managers create more value for the shareholders. Measures of such abilities include educational characteristics such as prestige of education or MBA degrees, interpersonal characteristics, and employment history and life experiences. The next question is whether managerial ability has any role in helping resolve financial distress.

Earlier literature on assessing the likelihood and severity of corporate financial distress used to focus solely on accounting variables and financial ratios. Beaver (1966) suggested a ratios-based model of bankruptcy prediction. Altman (1968) also used financial ratios to estimate the probability of bankruptcy, and presented a refined ratios-based model in Altman (2013). While original bankruptcy prediction models focused only on accounting data from subject companies, later research revealed than other data may also be relevant. DePamphilis (2015a) lists bankruptcy models that vary by data used and empirical methodology and divides them into four categories: credit scoring, structural, reduced form, and other models. Current bankruptcy research relies on a combination of variables, financial and non-financial. Altman et al. (2010) study importance of non-financial information in SME risk management and find that prior history of legal actions, company filing histories, audit report/opinion data and firm-specific characteristics improve power of prediction models. Not only accounting ratios, but also firm-specific characteristics of large publicly listed companies such as size and growth rate were shown to be good predictors of default by Tinoco and Wilson (2013). At the same time, market and economic conditions variables such as interest rates and GDP were only marginally useful. Next, in their study of financial distress for small and medium sized enterprises, Filipe et al. (2016) use firm-specific variables as well as economic variables, and find economic variables to be more relevant factors in predicting distress. Thus, it appears that there may be moderating variables, such as firm size, in the relationship between financial distress and economic conditions.

Shein (2011) lists three approaches that should be implemented jointly to be effective in resolving distress. They include strategic changes, operational changes, and financial changes, and together they form a so-called "turnaround tripod". Such strategies could be implemented in a myriad of ways. A company may choose to engage or not engage in corporate restructuring. One common tactic of resolving financial distress is through mergers and acquisitions, documented by Clark and Ofek (1994), Almeida et al. (2011), Gormley and Matsa (2011), among others. DePamphilis (2015b) outlines various possibilities for financial conditions of a failing company and specific methods of restructuring that are most effective in resolving distress. Also, a company in distress may choose to file or not file for bankruptcy, and firms filing for bankruptcy incur various direct and indirect transaction costs. On the other hand, Gilson (1997) finds evidence that firms not filing for bankruptcy protection have more difficulties in negotiations with creditors. In other

words, there are vast options in handling financial distress, not all options are equally effective, and the most appropriate ways out of trouble may depend on firm-specific circumstances and economic conditions.

Better qualified managers will be able to understand the situation more accurately and will find a more effective resolution. Lia et al (2010) offer evidence that CFO qualification is a key factor in deciding outcome of a financial distress. Leverty and Grace (2012) find that better skilled managers can get their companies out of distress faster, and companies that went bankrupt had less skilled executives. Andreou et al. (2017) study how firms survived the 2008 financial crisis and find evidence that better skilled managers improve firm performance and show more effective management during crisis. Next, Andreou et al. (2016) investigate bank managers and find that more qualified managers add more value both during normal business condition and during crisis. Höwer (2016) finds that manager relationship with financial institutions is significant in deciding outcomes of financial distress. Similarly, Cornaggia et al. (2017) provide evidence that manager qualification is considered by credit analysts for credit scoring, and higher ability managers obtain better credit ratings for their companies. To summarize, recent research offers evidence that manager qualification is an important factor for determining firm survival.

Data

Our dataset includes corporations that were in Fortune 500 list in 2008 and experienced a corporate restructuring event in the five-year window after the 2008 financial crisis, between 2008 and 2013. We obtain financial statements data for these companies from Compustat - Capital IQ database. Data on corporate bankruptcy, liquidations and reorganizations were obtained from UCLA-LoPucki Bankruptcy Research Database (BRD). Data on corporate restructuring events such as takeovers were obtained from the Wall Street Journal. Corporate governance data are hand collected from corporate web pages. Finally, the data on manager qualifications and experiences were hand collected from manager biographies available from corporate web pages and from Bloomberg Company Profiles database. We found 23 companies which matched our data requirements and had available observations for all relevant variables. Table 1 presents the history of corporate restructuring events for our companies. Variable ENDGAME describes the restructuring outcome for respective companies. In our dataset one company was liquidated during the five-year window, two companies filed for Chapter 11 and stayed independent, one company filed for Chapter 11 merged with another company. We also observe that 15 firms avoided filing for bankruptcy and either became acquisition targets, and 4 firms avoided bankruptcy through merger. When we consider relative frequencies of corporate restructuring events, we can see that 8 out of 23 events occurred in 2009 and this was the most active year for corporate restructuring in our dataset. Table 2 reports industry composition of our sample. Out of 23 firms, 1 corporation is in Telecommunication Services, two firms in each of the industry sectors Energy, Information Technology, and Utilities. Next, there are four firms in each of Consumer Discretionary, Consumer Staples, Health Care, and Industrials. Overall, our sample represents most sectors of the US economy and our data is not tilted towards any given industry sector.

Table 1: Outcome Data

Endgame	Ordered Choice	Number of Outcomes by Year						Total	Percent
		2008	2009	2010	2011	2012	2013		
Bankruptcy and liquidation	1	0	1	0	0	0	0	1	4.35%
Filed for Chapter 11 and stayed independent	2	0	1	0	0	1	0	2	8.70%
Filed for Chapter 11 and merged with another company	3	0	0	0	1	0	0	1	4.35%
No filing for Ch.7/Ch. 11 and became acquisition target	4	2	5	2	2	4	0	15	65.22%
No filing for Ch.7/Ch. 11 and merged with another company	5	0	1	1	0	1	1	4	17.39%
	Total	2	8	3	3	6	1	23	100

This table shows corporate restructuring outcomes for the year of the 2008 financing crisis, and for five years following the crisis. The firms listed in this table meet all data requirements for estimation of our empirical model. All companies in the sample were in Fortune 500 list in 2008 and experienced a corporate restructuring event in the five-year window after the 2008 financial crisis, between 2008 and 2013. We obtained financial statements data for these companies from Compustat - Capital IQ database. Data on corporate bankruptcy, liquidations and reorganizations were obtained from UCLA-LoPucki Bankruptcy Research Database (BRD). Data on corporate restructuring events such as takeovers were obtained from the Wall Street Journal. Corporate governance data are hand collected from corporate web pages. Finally, the data on manager qualifications and experiences were hand collected from manager biographies available from corporate web pages and from Bloomberg Company Profiles database.

Financial statements data for our sample companies are presented in Table 3. Total Assets range from $2,321.68 million to $91,047 million. EBIT ranges from -$11,982 million to $6,946.23 million, and Revenues vary between $3,799 million to $148,979 million. We use Altman (2013) revised Zeta model to assess the likelihood of bankruptcy and present relevant model inputs and computed Z-scores in Table 4. In our sample, average Working capital/Total Assets is 9.0522%, average Retained Earnings/Total Assets is 5.0334%, average EBIT/Total Assets is 4.3241%, average Market value of equity/Book value of Total Liabilities is 80.8672%, and average Revenues/Total assets is 1.4070. The computed Z-score is on average 2.2126 and ranges from -1.8868 to7.4258. Altman (2013) suggests the critical value of 2.675 for the Z-score. Hence, an average company in our sample is likely to go bankrupt because our mean Z-score of 2.2126 is below the critical level.

We use control variables to account for corporate governance effects on firm performance. Table 5 presents descriptive statistics for the corporate governance variables. Variable BDCLASSIFIED takes value of 1 if corporate board is classified and zero otherwise. DIROUTSIDE is a variable that indicates the number of independent directors, and DIRTOTAL is the total number of directors on the board. Variable OUTSIDE%= DIROUTSIDE/DIRTOTAL. For companies in our sample, the average number of independent directors is 8.4348, the average total number of directors is 10.8261, and average proportion of outside directors on company boards is 0.7688. To measure manager qualifications, we use variables identified in prior research. The descriptive statistics for qualifications data are presented in Table 6. Manager experience is measured by age that proxies for overall experience and firm tenure that measures firm-specific experience. Average AGE is 56.3044 and average FIRM TENURE is 11.4348 years. We also account for prior specific experiences by introducing three dummy variables. Variable GROWTH takes value of 1 if manager biography indicates successful business growth that was achieved because of the contribution by this individual. Variable RESTRUCTURING takes value of 1 if a manager led corporate restructuring effort that was unrelated to financial distress. Next, variable DISTRESS takes value of 1 if a

manager`s biography indicates that this manager survived through corporate bankruptcy or financial distress. Finally, we introduce three dummy variables that describe schooling. Variable SCHOOL takes the value of 1 if manager biography states that this individual graduated from any of the top 100 universities in the world, according to Times Higher Education ranking. Variables MBA and LAWDEGREE take value of 1 if the manager`s biography states this manager has MBA degree or a law degree. Otherwise, the dummy variables equal to zero. Correlations among manager qualification measures are also presented in Table 6. Several variables exhibit relatively high correlations, for example the correlation between variables MBA and SCHOOL is 0.7424, correlation between MBA and FIRM TENURE is -0.3553, correlation between RESTRUCTURING and GROWTH is 0.5231. Thus, we expect that multicollinearity among variables may be a problem and several estimated coefficients may appear insignificant while they may in fact be significant.

Table 2: Industry Composition of the Sample

Industry	Count	Percent
Consumer Discretionary	4	17.39%
Consumer Staples	4	17.39%
Energy	2	8.70%
Health Care	4	17.39%
Industrials	4	17.39%
Information Technology	2	8.70%
Telecommunication Services	1	4.35%
Utilities	2	8.70%
Total	23	100.00%

This table presents industry composition of our sample. Industry classification is done according to GIC Sector code data item obtained from Compustat Capital IQ database. Count is the number of firms in our sample per category, and Percent is the proportion of firms in the corresponding industry sector in the sample. The firms listed in this table meet all data requirements for estimation of our empirical model. All companies in the sample were in Fortune 500 list in 2008 and experienced a corporate restructuring event in the five-year window after the 2008 financial crisis, between 2008 and 2013. We obtained financial statements data for these companies from Compustat - Capital IQ database. Data on corporate bankruptcy, liquidations and reorganizations were obtained from UCLA-LoPucki Bankruptcy Research Database (BRD). Data on corporate restructuring events such as takeovers were obtained from the Wall Street Journal. Corporate governance data are hand collected from corporate web pages. Finally, the data on manager qualifications and experiences were hand collected from manager biographies available from corporate web pages and from Bloomberg Company Profiles database.

Table 3: Pre-Event Accounting Data, 2007-2012

	TOTAL ASSETS, $ Millions	WORKING CAPITAL $ Millions	RETAINED EARNINGS $ Millions	EBIT $ Millions	SHARES OUT STANDING $ Millions	SHARE PRICES, Dollars	MARKET VALUE EQUITY $ Millions	BOOK VALUE OF TOTAL LIABILITIES $ Millions	REVENUES $ Millions
Mean	20178.30	1318.60	-3487.43	640.68	451.09	28.45	9978.63	19397.31	21789.47
Median	13948.70	628.00	1660.82	697.60	295.00	22.51	4469.01	10182.00	12186.68
Maximum	91047.00	16630.92	11890.00	6946.23	1729.25	75.71	49946.59	176387.00	148979.00
Minimum	2321.68	-2068.80	-102926.00	-11982.00	54.42	0.35	117.34	1177.37	3799.00
Std. Dev.	19729.01	3729.84	24240.82	3244.92	482.28	22.20	12058.52	35306.66	31365.54
Obs.	23	23	23	23	23	23	23	23	23

This table presents financial statements data for the items needed to compute Altman's Z-Scores for all firms in our sample. TOTAL ASSETS is the Total assets item on a company's the balance sheet. WORKING CAPITAL is the difference between the total current assets minus total current liabilities as reported on a company's balance sheet. RETAINED EARNINGS is Retained earnings data item on a company's balance sheet. EBIT is Earnings before interest and taxes, as reported on a company's income statement. SHARES OUTSTANDING is Common Shares Outstanding, as reported on a company's balance sheet. SHARE PRICES is Price – Close annual data item in the Compustat. MARKET VALUE EQUITY is (SHARES OUTSTANDING) x (SHARE PRICES). BOOK VALUE OF TOTAL LIABILITIES is the sum of: Current Liabilities – Total, Deferred Taxes and Investment Tax Credit, Liabilities – Other, Long-Term Debt – Total, and Minority Interest data items on a company's balance sheet. This is Liabilities – Total data item in the Compustat. REVENUES is Revenue-Total data item in the Compustat, it represents the gross income received from all divisions of the company. Data items from the financial statements are the most recent available before the corporate restructuring event. For example, if a restructuring event occurred in 2009, the accounting data are from 2008 financial statements. The data are not adjusted for inflation because any inflation adjustments are canceled out in computing financial ratios and Altman's Z-Score, since accounting data from the same year are placed in the numerator and in the denominator of a financial ratio. We obtained financial statements data for these companies from Compustat - Capital IQ database.

Table 4: Bankruptcy Prediction Data

	X1, %	X2, %	X3, %	X4, %	X5	Z-score
Mean	9.0522	5.0334	4.3241	80.8672	1.4070	2.2126
Median	7.8851	23.9792	5.7541	66.6085	1.0073	1.9232
Maximum	37.7703	66.1976	15.7755	221.4188	4.6851	7.4258
Minimum	-12.1961	-213.1600	-13.1602	0.3790	0.2011	-1.8868
Std. Dev.	12.9895	59.7444	7.7512	61.2454	1.2687	1.9816
Observations	23	23	23	23	23	23

*This table presents bankruptcy prediction data required in Altman (2013) revised Zeta bankruptcy prediction model. X1= Working capital/Total Assets, X2=Retained Earnings/Total Assets, X3=EBIT/Total Assets, X4=Market value of equity/ Book value of Total Liabilities, X5= Revenues/ Total Assets. Altman's Z =0.012*X1+0.014*X2+0.033*X3+0.006*X4+0.999*X5. According to Altman (2013), the critical value of Z-score which indicates a high probability of bankruptcy is 2.675. Companies with scores lower than 2.675 have higher likelihood of bankruptcy; companies with scores above 2.675 have lower likelihood of bankruptcy. Estimated means of variables X1 through X5 reported in Altman (2013) are as follows. Sample of bankrupt firms: X1=-6.1%, X2=-62.6%, X3=-31.8%, X4=40.1%, X5=1.5. Sample of non-bankrupt firms: X1=41.4%, X2=35.5%, X3=15.4%, X4=247.7%, X5=1.9.*

Table 5: Corporate Governance Data

	BDCLASSIFIED	DIROUTSIDE	DIRTOTAL	OUTSIDE %
Mean	0.6087	8.4348	10.8261	0.7688
Median	1	9	11	0.8333
Maximum	1	15	17	0.9231
Minimum	0	0	6	0
Std. Dev.	0.4990	3.0870	2.6569	0.1935
Observations	23	23	23	23

This table presents variables that describe corporate governance regimes in the firms from our sample. Variable BDCLASSIFIED is a dummy variable that takes value of 1 if the board is classified, and zero otherwise. Variable DIROUTSIDE is the number of independent directors on the board. DIRTOTAL is the total number of directors on the board. OUTSIDE%= DIROUTSIDE/DIRTOTAL.

Table 6: Manager Qualifications Data

	Age	Firm Tenure	School	MBA	Law Degree	Growth	Restructuring	Distress
Mean	56.3044	11.4348	0.5217	0.4783	0.0870	0.4348	0.1739	0.0435
Median	56	9	1	0	0	0	0	0
Maximum	70	27	1	1	1	1	1	1
Minimum	45	1	0	0	0	0	0	0
Std. Dev.	6.9114	8.2121	0.5108	0.5108	0.2881	0.5069	0.3876	0.2085
	Correlations							
AGE	1							
FIRM TENURE	-0.0417	1						
SCHOOL	0.1590	-0.1432	1					
MBA	0.2144	-0.3553	0.7424	1				
LAWDEGREE	-0.1509	0.3099	0.2955	0.0134	1			
GROWTH	0.4146	-0.0912	-0.0382	0.0382	-0.2707	1		
RESTRUCTURING	0.2000	-0.3390	-0.2496	0.0200	-0.1416	0.5231	1	
DISTRESS	0.1166	-0.2504	-0.2227	0.2227	-0.0658	0.2431	0.4647	1
Observations	23	23	23	23	23	23	23	23

This table presents manager qualifications data. Variable AGE is the CEO's age at the time of the distress event; this variable is a proxy for overall industry experience. Variable FIRM TENURE is the number of years the manager had been employed by the firm in any capacity at the time of the distress event. It proxies for a firm-specific experience. Variable SCHOOL is a dummy variable that takes value of 1 if the manager graduated from a university listed in top 100 universities in Times Higher Education ranking available at https://www.timeshighereducation.com/world-university-rankings , and zero otherwise. MBA is a dummy variable that takes value of 1 if the manager has an MBA degree, and zero otherwise. LAWDEGREE is a dummy variable that takes value of 1 if the manager has a law degree, and zero otherwise. GROWTH is a dummy variable that takes value of 1 if the manager's biography indicates this manager took an active role in achieving outstanding business growth, and zero otherwise. RESTRUCTURING is a dummy variable that takes value of 1 if the manager's biography indicates this manager previously assumed an active role in corporate restructuring that was not related to financial distress and corporate turnarounds, and zero otherwise. DISTRESS is a dummy variable that takes value of 1 if the manager's biography indicates this manager previously assumed an active role in managing financial distress and corporate turnarounds, and zero otherwise.

METHODOLOGY

The choice of method is driven by the variability of ways how firms emerge from distress. Similar problems of outcome severity in social sciences have been successfully studied using ordered choice models, as described in Greene and Hensher (2010). We use an ordered logit model to study how manager qualifications affect financial distress outcomes for companies in our sample. Let $S_i = k$ be the qualitative corporate restructuring outcome of financial distress in terms of firm's independence and continuation as a going concern. We rank the outcomes from 1 to 5 as described from the perspective of firm survival as a going concern, and acknowledge that this ranking may be different if viewed from a different perspective.

The least preferred outcome for shareholders is liquidation; hence we assign value of k=1 to this choice. A preferable choice is filing for bankruptcy and engaging in Chapter 11 reorganization as opposed to Chapter 7 liquidation, hence we assign a higher value of k=2 to this choice. The next choice is filing for Chapter 11 and merging with another company, k=3, a thoroughly documented by Clark and Ofek (1994) method of corporate survival. Choice k= 4 is avoiding Chapter 11 filing and becoming an acquisition target. It is better than the previous choice because no filing for bankruptcy takes place. Lastly, choice k=5 is the most preferred choice out of all available choices in our dataset; a company avoids filing for bankruptcy and retains a reasonably strong negotiating position so that it is not an acquisition target but a merger partner. In this model, we consider a latent variable S_i*, associated with the actual corporate restructuring outcome S_i, and presume that a mathematical relationship exists between the corporate restructuring outcome and a set of explanatory variables. We define four thresholds h_{im}, m=1,2,3,4, which divide the imaginary corporate restructuring space into five outcome categories listed above. The actual corporate restructuring outcome S_i is described as follows:

$$S_i = k = \begin{cases} 1, if\ -\infty < S_i^* < h_{i,1} \\ m, if\ h_{i,m-1} < S_i^* < h_{i,m}, \text{ m=2,3,4} \\ 5,\ \ if\ h_{i,4} < S_i^* < +\infty \end{cases} \quad (1)$$

The latent variable S_i * is the predicted corporate restructuring outcome and can be described in the following equation:

$$S_i^* = \gamma_i + \varepsilon_i = \beta_Z \times Z_i + \sum_{d=1}^{n} \beta_d M_{i,d} + \sum_{p=1}^{q} \beta_p G_{i,p} + \varepsilon_i \quad (2)$$

where $\beta_Z, \beta_d, \beta_p$ are coefficients, Z_i is Altman's Z-score for company i, $M_{i,d}$ is management qualification variable for company i, d = 1 to 8 in our case as there are n=8 variables which describe manager qualifications. $G_{i,p}$ is a governance control variable for company i, there are q=2 control variables in our model. Lastly, ε_i is an error term that is assumed to follow a logistic distribution.

We estimate six different specifications of the empirical model described in equation (2). Many explanatory variables are correlated with each other, as shown in Table 6. In formulating model specifications, we always include Altman's Z-score and corporate governance control proxies. Next, we include different combinations of the manager qualifications variables and verify whether the estimated coefficients remain statistically significant, in a manner similar to estimating a stepwise regression model.

ESTIMATION RESULTS

We estimate the thresholds h_{im}, m=1,2,3,4, as well as coefficients $\beta_Z, \beta_d, \beta_p$, d = 1 to 8, using a maximum log likelihood procedure by using Newton-Raphson optimization algorithm. The estimation results are presented in Table 7. Each model specification produces a highly significant likelihood ratio statistic

ranging from 14.6360 to 27.6374, which verifies the existence of the relationship between our explanatory variables and the variance in corporate restructuring outcomes. Pseudo R-squared for our specifications varies between 0.2979 and 0.5728; hence, the model explains a significant portion in the variation of outcomes. The significant variables for deciding the restructuring outcomes of financial distress are listed below and reported in Table 7. The first two variables describe general and firm – specific experience. Log (Age) is positive and significant in specification (6), its coefficient is 38.7112 and significant at 10% level. Given that Age is a proxy for general experience, we interpret this as evidence that more experienced managers should improve chances of survival. Variable FIRM TENURE is positive significant in specifications (1) and (2), for example for specification (2) the coefficient for FIRM TENURE is 0.2875 and significant at 5% level. This offers more evidence that firm-specific experience is another positive factor for survival. These results are in line with existing literature, for example Kaplan et al (2012), Custódio et al. (2013), Falato et al. (2015), Cornaggia et al. (2017) find similar effects of general experience and ability on firm performance.

Table 7: Estimation Output

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Zetaindex	-0.3656	-0.3313	-0.4347	-0.1897	0.2031	-0.0772
	(0.3985)	(0.6717)	(0.5763)	(0.8144)	(0.8156)	(0.9012)
Log(Age)	-0.8293	24.7838	28.4870	25.6763	41.2576	38.7112*
	(0.9077)	(0.2175)	(0.2089)	(0.1424)	(0.1041)	(0.0616)
Firm Tenure	0.1363*	0.2875**	0.3936	0.2090	0.2245	0.3150
	(0.0907)	(0.0473)	(0.1494)	(0.1327)	(0.2597)	(0.2535)
School	2.7420**	8.0245***	8.3698**	7.0045***		4.5809
	(0.0454)	(0.0017)	(0.0258)	(0.0000)		(0.3405)
Mba			1.7835		7.9687***	5.5707
			(0.5250)		(0.0056)	(0.2407)
Lawdegree				2.5442	9.6726**	6.4042
				(0.2543)	(0.0173)	(0.2371)
Growth	2.2139	3.0638	3.7761	2.6683	2.6884	3.4771
	(0.3896)	(0.4870)	(0.3924)	(0.5541)	(0.4992)	(0.2861)
Restructuring	-4.0085	-15.0687***	-17.7596**	-14.2199***	-17.3596***	-19.2422*
	(0.1954)	(0.0002)	(0.0153)	(0.0000)	(0.0000)	(0.0558)
Distress	5.2978**	18.8328***	21.1680**	16.9951***	12.0082***	17.8901
	(0.0112)	(0.0013)	(0.0244)	(0.0000)	(0.0049)	(0.3847)
Bdclassified		-4.2838	-5.3401	-4.0116*	-5.6564	-6.2845*
		(0.1018)	(0.1278)	(0.0795)	(0.1058)	(0.0963)
Outside%		0.9775	-0.0247	-0.2673	-11.7813	-7.0942
		(0.8561)	(0.9965)	(0.9602)	(0.1763)	(0.3517)
Pseudo R-squared	0.2979	0.5320	0.5368	0.5414	0.5462	0.5728
Schwarz criterion	2.9992	2.8529	2.9829	2.9729	2.9623	3.0444
Hannan-Quinn criter.	2.5928	2.3601	2.4521	2.4421	2.4315	2.4758
LR statistic	14.6360**	25.6685***	25.9005***	26.1205***	26.3542***	27.6374***
Prob(LR statistic)	0.0410	0.0023	0.0039	0.0036	0.0033	0.0037
Akaike info criterion	2.4562	2.2082	2.2886	2.2786	2.2680	2.3005
Log likelihood	-17.2461	-11.2904	-11.1744	-11.0644	-10.9476	-10.3059

*This table shows estimation results based on equation (2). We use specifications (1-6) to mitigate the effects of multicollinearity in the explanatory variables. The latent variable S_i * is the predicted outcome: $S_i^* = \gamma_i + \varepsilon_i = \beta_Z \times Z_i + \sum_{d=1}^{n} \beta_d M_{i,d} + \sum_{p=1}^{q} \beta_p G_{i,p} + \varepsilon_i$, where β_Z, β_d, β_p are coefficients, Z_i is Altman's Z-score for company i, $M_{i,d}$ is management qualification variable for company i, d = 1 to 8. $G_{i,p}$ is a governance control variable for company i, there are q=2. Lastly, ε_i is an error term. The time period is from 2008 to 2013. ZETAINDEX is the Altman's Z-score. Management qualification variables include the following. LOG(AGE) is the natural logarithm of a firm manager's CEO at the time of the onset of the corporate restructuring event. FIRM TENURE is the CEO's tenure at the firm. Dummy variable GROWTH = 1 if manager biography indicates successful business growth that was achieved because of the contribution by this individual. RESTRUCTURING = 1 if a manager led corporate restructuring effort that was unrelated to financial distress. DISTRESS = 1 if a manager survived through prior corporate bankruptcy or financial distress. SCHOOL = 1 if manager graduated from any of the top 100 universities in the world, according to Times Higher Education ranking. MBA and LAWDEGREE = 1 if the manager has MBA degree or a law degree. Governance control variables include the following. BDCLASSIFIED = 1 if corporate board is classified. Otherwise, the dummy variables equal to zero. OUTSIDE% is the proportion of outside directors in the corporate board. p-values in parentheses. *** indicates 1% significance, ** indicates 5% significance, * indicates 10% significance levels.*

The next three variables describe qualifications. Variable SCHOOL is statistically significant in Specifications 1, 2, 3, and 4. For example, in specification (4) the coefficient for SCHOOL is estimated

7.0045 with p-value < 0.0001. Managers who graduated from top schools deliver added positive contribution to corporate restructuring outcome. Variable MBA is positive and significant in specification (5), the coefficient for this variable is 7.9687 with p-value 0.0056. Variable LAWDEGREE is also significant in specification (5), we presume this result is because MBA and LAWDEGREE are highly correlated with variable SCHOOL. Recall that in Table 6 the estimated correlation between MBA and SCHOOL is 0.7424, and the estimated correlation between LAWDEGREE and SCHOOL is 0.2955. Thus, the fact that these variables appear insignificant in other specifications may be due to the statistical properties of the data and not because these factors are irrelevant. These effects are in line with recent literature on the relationship between education and firm performance, for example with Chemmanur and Paeglis (2005), Switzer and Huang (2007), Rakhmayil and Yüce (2013), and contrast with earlier findings by Pfeffer and Fong (2002) and Gottesman and Morey (2010). We interpret these results as a possible confirmation that business schools may have adjusted their curriculum and made it more relevant for modern business decision making.

Next, consider the estimated coefficient for RESTRUCTURING. In specifications 2, 3, 4, 5, and 6 it is negative and significant. For example, in specification 3 it is estimated -17.7596 with p-value 0.0153. Recall that variable RESTRUCTURING describes prior experience in corporate restructuring that is not related to dealing with financial distress. It seems that the fact that an average manager has this experience is a detrimental factor that increases the likelihood of observing lower ranked outcomes, for example bankruptcy and liquidation. Note that this experience is not related to dealing with distress, and we could speculate that when a manager has prior experience of changing corporate structure but not dealing with distress, one may expect that instead of addressing the financial distress problem directly, such manager may engage in corporate restructuring instead of directly dealing with the cause of financial difficulties. An alternative explanation is that because in Table 6 variables RESTRUCTURING and GROWTH have estimated correlation 0.5231, we might be observing another effect of multicollinearity and should not take this coefficient sign at face value. Finally, the coefficient for variable DISTRESS is positive and significant in specifications 1, 2, 3, 4, and 5. For example, the coefficient in specification 5 is estimated 12.0082 with p-value 0.0049. This provides clear evidence that prior experience of dealing with financial distress is a key factor, and a manager who has such experience should improve chances of corporation survival as an independent going concern. These results are similar to findings by Lin et al. (2011) in a sense that relevant experience, even if it was obtained in a different context, proves to be an asset.

Scenario Analysis

It may be difficult to interpret parameter estimates in Table 7 because the model is specified in terms of cumulative probability distribution for the predicted corporate restructuring outcome variable S_i *. To illustrate the relationships between our covariates and the fitted value of S_i *, we conduct scenario analysis and present the results in Table 8. We consider several scenarios where some covariates are set to zero, and study how substituting a maximum or minimum value of a specific combination of covariates affects the predicted outcome. This will help us better understand how each constellation of parameters should affect the outcome of financial distress. The first scenario is a situation where a company with average parameters runs into serious financial distress. The seriousness of distress is modeled by the value of Z-score = -1.8868, which is the reported in Table 4 the smallest Z-score in our sample. All other model inputs are set at their average values. CEO's age is set to 56, firm tenure is set to 11, the company has a classified board, there are 8 outside directors and the total number of directors is 10. These parameters are average values for our covariates

Table 8: Scenario Analysis

Description	Parameters	Predicted Outcome
Scenario 1. An average company runs into serious financial distress	Z-Score =-1.8868, Age =56, FIRM TENURE = 11, BDCLASSIFIED=1, Outside Directors =8, Total Directors = 10, all other variables = 0	No filing for Ch.7/Ch. 11 and became acquisition target
Scenario 2. An average company run by insiders runs into serious financial distress	Z-Score =-1.8868, Age =56, FIRM TENURE = 11, BDCLASSIFIED=1, Outside Directors =0, Total Directors = 10, all other variables = 0	No filing for Ch.7/Ch. 11 and became acquisition target
Scenario 3. An average company runs into serious financial distress and hires a new CEO from outside the firm. The CEO has experience running companies but lacks experience managing distress.	Z-Score =-1.8868, Age =56, FIRM TENURE = 0, BDCLASSIFIED=1, Outside Directors =8, Total Directors = 10, all other variables = 0	Filed for Chapter 11 and stayed independent
Scenario 4. An average company runs into serious financial distress. The company CEO is highly educated in business and has experience in corporate restructuring but not in managing distress.	Z-Score =-1.8868, Age =56, FIRM TENURE = 11, SCHOOL =1, MBA=1, BDCLASSIFIED=1, RESTRUCTURING =1, Outside Directors =8, Total Directors = 10, all other variables = 0	Bankruptcy and liquidation
Scenario 5. An average company runs into serious financial distress. The company hires a brand new highly educated young CEO to manage the situation.	Z-Score =-1.8868, Age =35, FIRM TENURE = 0, SCHOOL =1, MBA=1, BDCLASSIFIED=1, Outside Directors =8, Total Directors = 10, all other variables = 0	Bankruptcy and liquidation
Scenario 6. An average company runs into serious financial distress. The company hires a highly educated CEO to manage the situation. The new CEO has experience managing distress.	Z-Score =-1.8868, Age =45, FIRM TENURE = 0, SCHOOL =1, MBA=1, DISTRESS=1 BDCLASSIFIED=1, Outside Directors =8, Total Directors = 10, all other variables = 0	No filing for Ch.7/Ch. 11 and merged with another company
Scenario 7. An average company is on the verge of financial distress.	Z-Score = 2.675, Age =56, FIRM TENURE = 11, BDCLASSIFIED=1, Outside Directors =8, Total Directors = 10, all other variables = 0	Filed for Chapter 11 and merged with another company
Scenario 8. An average company is on the verge of financial distress. The company hires a new CEO with reasonable business experience.	Z-Score = 2.675, Age =56, FIRM TENURE = 0, BDCLASSIFIED=1, Outside Directors =8, Total Directors = 10, all other variables = 0	Filed for Chapter 11 and stayed independent

This table presents results of scenario analysis to illustrate the estimated results. Narrative description of the scenario is presented in Description section of the table. Estimated coefficients are taken from Table (7) and substituted into equation (2) together with scenario variables listed in the Parameters section of the table. The actual corporate restructuring outcome S_i is described in equation (1) as follows:

$$S_i = k = \begin{cases} 1, if\ -\infty < S_i^* < h_{i,1} \\ m, if\ h_{i,m-1} < S_i^* < h_{i,m}, m=2,3,4 \\ 5,\ if\ h_{i,4} < S_i^* < +\infty \end{cases}$$

where k=1 stands for liquidation, k=2 denotes Chapter 11 reorganization, k=3 denotes filing for Chapter 11 and merging with another company, k=4 denotes avoiding Chapter 11 filing and becoming an acquisition target, and k=5 stands for not filing for bankruptcy and becoming a partner in the merger of equals.

Table 8: Scenario analysis (continued)

Description	Parameters	Predicted outcome
Scenario 9. An average company is on the verge of financial distress. The company hires a new CEO. The CEO does not have prestigious educational background but does have experience managing financial distress.	Z-Score = 2.675, Age =56, FIRM TENURE = 0, DISTRESS=1, BDCLASSIFIED=1, Outside Directors =8, Total Directors = 10, all other variables = 0	No filing for Ch.7/Ch. 11 and merged with another company
Scenario 10. An average company is on the verge of financial distress. The company hires a brand new highly educated middle age CEO to manage the situation. The new CEO does have experience managing distress.	Z-Score = 2.675, Age =45, FIRM TENURE = 0, SCHOOL =1, MBA=1, DISTRESS=1 BDCLASSIFIED=1, Outside Directors =8, Total Directors = 10, all other variables = 0	No filing for Ch.7/Ch. 11 and merged with another company
Scenario 11. An average company is on the verge of financial distress. The company is run by a highly educated CEO who has experience in corporate restructuring but not managing distress.	Z-Score = 2.675, Age =56, FIRM TENURE = 11, SCHOOL =1, MBA=1, RESTRUCTURING =1, BDCLASSIFIED=1, Outside Directors =8, Total Directors = 10, all other variables = 0	Bankruptcy and liquidation
Scenario 12. An average company is on the verge of financial distress. The company is run by a highly educated CEO with business degree.	Z-Score = 2.675, Age =56, FIRM TENURE = 11, SCHOOL =1, MBA=1, BDCLASSIFIED=1, Outside Directors =8, Total Directors = 10, all other variables = 0	No filing for Ch.7/Ch. 11 and became acquisition target
Scenario 13. An average company is on the verge of financial distress. The company hires a brand new highly educated middle age CEO to manage the situation. The new CEO has no experience managing distress.	Z-Score = 2.675, Age =45, FIRM TENURE = 0, SCHOOL =1, MBA=1, BDCLASSIFIED=1, Outside Directors =8, Total Directors = 10, all other variables = 0	Filed for Chapter 11 and stayed independent
Scenario 14. An average company is on the verge of financial distress. The company is run by a CEO who has extensive company experience, graduated from prestigious university, does not have an MBA, and only has experience in corporate restructuring but not managing distress.	Z-Score = 2.675, Age =56, FIRM TENURE = 30, SCHOOL =1, RESTRUCTURING =1, BDCLASSIFIED=1, Outside Directors =8, Total Directors = 10, all other variables = 0	Filed for Chapter 11 and stayed independent
Scenario 15. An average company is on the verge of financial distress. The company is run by a CEO who has extensive company experience, does not have an MBA or prestigious educational background, and has experience in business growth and corporate restructuring, but not managing distress.	Z-Score = 2.675, Age =56, FIRM TENURE = 30, RESTRUCTURING =1, GROWTH=1, BDCLASSIFIED=1, Outside Directors =8, Total Directors = 10, all other variables = 0	Bankruptcy and liquidation

*The latent variable S_i * is the predicted corporate restructuring outcome and can be described in equation (2): $S_i^* = \gamma_i + \varepsilon_i = \beta_Z \times Z_i + \sum_{d=1}^{n} \beta_d M_{i,d} + \sum_{p=1}^{q} \beta_p G_{i,p} + \varepsilon_i$ where β_Z, β_d, β_p are coefficients, Z_i is Altman's Z-score for company i, $M_{i,d}$ is management qualification variable for company i, d = 1 to 8 in our case as there are n=8 variables which describe manager qualifications. $G_{i,p}$ is a governance control variable for company i, there are q=2 control variables in our model. Lastly, ε_i is an error term that is assumed to follow a logistic distribution. The choice of specification for equation (2) is based on the choice of relevant scenario variables and the highest LR statistic in Table (7). Predicted outcome from equation (2) is substituted into equation (1), which gives the most likely outcome, listed in Predicted outcome section of the table.*

reported in Tables 5 and 6. We round down the average values to make them sensible, i.e. a company will have 10 directors on board in total, not 10.8261 directors. Table 8 shows that such scenario should result in the company not filing for Chapter 11 but instead becoming an acquisition target. The outcome in Scenario

1 is the same as in Scenario 2, where the corporate board is filled with insiders, since Outside Directors = 0. Thus, we conclude that once an average company finds itself in financial distress, whether the board is run by insiders or outsiders makes little difference.

Consider Scenario 3, where an average company board is dominated by outsiders, just like in Scenario 1, and the board fires the old CEO and hires a new one, and the new CEO has average general management experience (Age = 56, Firm Tenure = 0). Under these circumstances the company is likely to file for Chapter 11 and stay independent. Contrast this with Scenario 4, where the company has the same parameters and the new CEO is highly educated and has irrelevant corporate restructuring experience and no experience managing distress. In such scenario the model predicts that the firm will enter bankruptcy process and will be liquidated. Thus, we can see that additional education, coupled with irrelevant experience, appears to present risk to company survival, which is a surprising outcome and we are not sure how to interpret it. We speculate that education provides greater knowledge, but this knowledge is detrimental to company survival when it is coupled with irrelevant experience. The same outcome, bankruptcy, and liquidation, is predicted in Scenario 5 when the newly hired CEO is highly educated (SCHOOL=1, MBA=1) but has limited general experience (Age = 35) and possesses no specific experience in managing distress or corporate restructuring. Liquidation is averted in Scenario 6, where the new CEO has greater general experience and prior experience in managing corporate distress (Age = 45, DISTRESS = 1). Under these circumstances the model predicts that the company will not file for Chapter 11 but instead will merge with another company.

The next set of scenarios considers a possibility that a company is on the verge of financial distress but the financial condition is not ominous yet. We use Z-score 2.675 to account for this condition, since Altman (2013) lists this value as the critical value for the Z-score. Consider Scenario 7, an average company finds itself on the verge of distress. The predicted outcome is filing for Chapter 11 and merging with another company. This outcome is in line with evidence presented in Clark and Ofek (1994). It is interesting to compare this outcome with one in Scenario 8, where the current CEO is dismissed and a new one is hired (Firm Tenure = 0), which results in a predicted outcome that the company files for Chapter 11 and stays independent. If the new CEO has experience managing financial distress (DISTRESS=1) in Scenario 9, such company is predicted to not file for bankruptcy and to merge with another company. Similarly, in Scenario 10 the newly hired CEO has experience managing distress, has good education (SCHOOL=1, MBA=1, DISTRESS=1) and the company is predicted to not file for bankruptcy just like in Scenario 9.

Examine a different situation in Scenario 11. The company has a CEO who has prestigious education but irrelevant experience (SCHOOL=1, MBA=1, RESTRUCTURING=1). This scenario is similar to Scenario 4 except here the financial situation of the company is borderline (Z-score = 2.675) and not as grim as in Scenario 4 (Z-score = -1.8868). However, the predicted outcome is still bankruptcy and liquidation. This scenario leads to a conjecture that existence of irrelevant experience seems to be a detrimental factor for corporate managers, since companies whose CEOs have restructuring experience but not financial distress experience are systematically predicted to end up in liquidation. Furthermore, Scenario 12 considers a company in an analogous situation as above, but whose manager does not have restructuring experience. The model predicts that such company will end up not filing for bankruptcy protection and will likely become an acquisition target.

Consider what happens in Scenario 13 when the board dismisses the previous CEO and hires a new manager who has outstanding educational credentials and less than average general experience (Firm Tenure = 0, Age =45). This is similar to Scenario 10 but here the new manager does not have prior experience of dealing with distress. The model predicts that the company will file for Chapter 11 and stay independent, while in Scenario 10 above the company was predicted to not have to file for bankruptcy. This again shows that existence of prior experience is a key factor that determines the outcome of distress.

Lastly, imagine that a company is run by an experienced CEO than has been with the company for a long time (Age = 56, Firm Tenure = 30), but in Scenario14 the manager has better education and some unrelated to distress experience (SCHOOL=1, RESTRUCTURING=1) while in Scenario 15 the CEO does not have education but instead this manager has a lot of various prior experiences than are unrelated to distress (GROWTH=1, RESTRUCTURING=1). In both scenarios the company is at the brink of financial distress (Z-score = 2.675). The outcome for the manager with excellent education is filing for Chapter 11 and staying independent, while the outcome for the company run by a very experienced manager with less excellent education is bankruptcy and liquidation.

To summarize, scenario analysis based on our empirical model shows the following regularities. First, good education helps improve the outcome of financial distress, but there is a limit to such improvement and if the financial condition of the company is very poor, no amount of education will prevent liquidation. Second, various scenarios seem to suggest that prior unrelated experience of managers, such as experience in corporate restructuring that is not related to financial distress, is damaging for the outcome and makes bankruptcy and liquidation more likely. Lastly, prior relevant experience of managing financial distress is an outcome-determinative factor for corporate survival. Overall, we can see that once a company finds itself in distress, the outcome of this situation will depend on a financial condition and a constellation of managerial qualifications and prior experiences.

CONCLUSION

Financial distress always brings uncertainty to investors, customers, suppliers, employees, and other stakeholders associated with the company. We study how managerial characteristics influence the outcome of distress and whether the corporation has any hopes of surviving as a going concern. This paper uses an ordered logit model to capture the effects of variability in manager education and prior experiences on the way a corporation emerges from financial distress. The results of this research illustrate the relationship between different managerial characteristics and experiences on one hand, and corporate survival and post-distress organizational structure on the other hand. We analyze how managerial characteristics are related to corporate survival as going concern, as well as to the modes of organizational structure after distress. Our dataset contains measures for CEO age, firm tenure, university, MBA or law degree, and prior experiences such as firm growth, corporate restructuring, and surviving through financial distress. We find evidence that these managerial characteristics are jointly related to the likelihood of survival. Empirical results provide the strongest support for the relationship between survival and manager's school, prior restructuring experience, and prior experience of surviving financial distress.

This research is limited to the specific industry sectors used in the study. It is also limited by the small number of observations. The empirical model was estimated using data from the following industries: Consumer Discretionary, Consumer Staples, Energy, Health Care, Industrials, Information Technology, Telecommunication Services, and Utilities. Unfortunately, no data was available from Materials, Financials, and Real Estate industries. Hence, generalizations of the results to the missing industry sectors may be problematic. Next, only 23 firms were used in the study due to data availability problems. Estimation of the model requires a large number of data items that are often unavailable several years after liquidation or restructuring. Future research that uses more firms might perhaps pinpoint additional details in the relationship between managerial skills and corporate restructuring outcomes.

Finally, we conduct scenario analysis based on our empirical model. The results of scenario analysis show that better educated managers improve chances of corporate survival. Another positive factor for improving the likelihood of survival is prior experience of successfully managing a company through distress. Irrelevant experience, shortage of general industry experience, and severe financial condition all lead to bankruptcy no matter how well educated a manager is.

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BIOGRAPHY

Sergiy Rakhmayil is an Associate Professor of Finance at Ryerson University. He received his Ph.D. in Finance from the University of Manitoba in 2005. Sergiy Rakhmayil is a CFA® charterholder. His research is focused on corporate finance and international finance.

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CORPORATE SUSTAINABILITY: DO EXECUTIVES AND INVESTORS CARE?- AN EMPIRICAL STUDY

Sekhar Amba, New York Institute of Technology

ABSTRACT

This research examines the association between corporate sustainability reporting ESG score and firm's financial performance, Executive compensation. Empirical analysis is performed on firms listed on S&P 500 and S&P/TSX firms. Regression method is used to test the impact of ESG score of a year on next years' ROE and Executive compensation. Empirical evidence suggests that ESG scores of an year has an impact on ROE of the following year during the period of investigation 2011 to 2015, whereas ESG scores showed similar impact on Executive compensation from the year 2013 onwards suggesting executive compensation is tied to corporate sustainability performance.

JEL: G3, M2

KEYWORDS: Sustainability, ESG, ROE, Executive Compensation

INTRODUCTION

In everyday life, at homes and offices attention is being paid to save water, energy and attempt to minimize waste. Schools are focusing their energies in inculcating environmental consciousness among youth. Environmentally conscious consumers are perceived to choose more sustainable products and consuming services from firms who pay attention to Environment and society. These environment conscious awakening public tend to buy products which are environment friendly or invest in those companies' stock who produce such products and services incorporating environment friendly and sustainability factors in designing and production process. Investment community started paying attention in identifying those companies which are environmentally conscious for their portfolio strategies such as socially responsible Investing (SRI). SRI represents an investment style which screens companies in a portfolio based on social moral ethical and religious criteria thus excluding companies whose revenue stream even a small percentage comes from sin companies such as weapons tobacco alcohol and gambling. Thus, SRI strategies exclude stocks of those companies in portfolio of investments in certain industries or sub-industries which are associate with socially taboo areas (Mahn, 2016). But the critics argue in favor of excluding companies that were perhaps "sinful" in certain areas and still have positive and sustainable characteristics. This exclusion minimizes risk diversification opportunism for portfolio managers thus limiting growth potential of investment (Mahn, 2016). These criticisms of SRI lead to developing a broader ecosystem of investment choices by including Environmental, Social and Governance (ESG) factors. Environmental factors represents proactive involvement of companies in natural environment, suppliers, customers and communities where they operate, Social factors represents companies managing strategies with employees and Governance factors represents companies leadership, executives' pay, audits and internal controls and stakeholder rights factors. Companies such as Thomson Reuters, MSCI, Morning star and Sustainalytics conduct in-depth research on arriving ESG scores for companies, helping investors and portfolio managers in making their investment choices.

Sustainability measures often referred to as environmental, social and governance metrics, although definitions vary considerably among activists and investors. Sustainability development is defined as "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Hubbard 2009). The primary objective of any organization is to maximize wealth of the shareholders which necessitates management to take decisions resulting in higher dividend yield and increase in market price of the shares. Market price is an indicator of progress, prosperity, profitability, productivity and prospects of a business enterprise. It's important that firms board of directors and top executive team understand investor interests and other stake holders. Based on their understanding organization's leadership align corporate strategy and behavior to achieve investor's short term and long-term expectations. However sustainability philosophy hypothesize that we move beyond the narrow version of classical economic theory and evolve corporate strategies beyond maximizing shareholders wealth and thus evolve strategies in addressing the demands of diverse group of stakeholders (Lopez,Garcia & Rodriguez,2007). A corporation which accommodates triple platform Environmental, Social and Governance contributes to sustainable development (Ngwakwe, 2008).If executives perceive that their investors focus on short-term profits, they will tend to organize sales, and cost management, to maximize such profits rather than make certain long-term investments. MIT Sloan Management Review-BCG survey 2016(Gregory & Kruschwitz2016) found that the Seventy-four percent of all surveyed investors believe that sustainability performance matters more than it did three years ago. According to the survey greater number of investors making investment decisions based on sustainability performance. Thus, corporate leaders must pay attention to growing investor attention to corporate involvement in sustainability and address shareholders curiosity about ESG investments and shareholders wealth maximization. A recent global online study "Sustainability Outperform Those That Don't" (Nielsen N.V, 2015) 66% of global consumers say they're willing to pay more for Sustainable Brands, up 55% from 2014. 73% of global millennials are willing to pay extra for sustainable offerings, up from 50% in 2014.A survey conducted by Global Sustainable Investment Alliance found that assets under management integrating sustainability investment strategies reached $21.1 trillion globally as of the beginning of 2014, up 61% from the onset of 2012 and in 2016 its amount to $22.89 trillion up 25% from 2014(Global Sustainable Investment Review 2016). One way to compensate executives is based on sustainability scores. Coro (2013) in her research "Sustainable Pay" found that 57% of Canadian companies listed on TSX 60, consider sustainability in annual incentive plan of which 24 companies awarded bonus for annual sustainability performance.

Thus, it's pertinent to explore whether Executives and investors really care about companies ESG involvement or simply care about just monetary gains irrespective of ESG score. This research paper attempts to explore whether sustainability matters in investment choices and do executives' pay is incentivized in adopting sustainability in creating shareholders wealth within the context of Canadian publicly traded firms. This paper is divided in to five sections: Introduction, Literature Review, Data & Methodology, Results &Discussions and Conclusion & Recommendations.

LITERATURE REVIEW

ESG measurements are expected to shed light on additional dimensions of corporate performance, which accounting data fails to reveal thus contending company's financial statements fails to communicate to investors and external stake holders about the value of reputation, quality, brand equity, safety, workplace culture and environmental pro-active measures which are more significant than ever in a knowledge-based global economy. Thus, this ESG scores can be utilized by investors in evaluating company's performance in addition to accounting measures (Galbreath 2013, Basen & Kovacs 2008).

Research by Dyck ,Lins, Karl and Lukas (2015) in their research paper examined institutional investors influence on a firm's commitment to corporate social responsibility (CSR) for a large sample of firms

from 41 countries over the period 2004 through 2013 found that institutional ownership is positively associated with firm-level environmental and social commitments. These positive associations are attributed to domestic institutional investors and non-U.S. foreign investors whereas U.S. institutional investors holdings did not show such association. These higher associations are noticeable with long-term investors such as pension funds but not with hedge funds. Institutional investors, predominantly 28% of mutual funds and 40% of pension funds filed ESG-related requests to their portfolio companies in the US and Europe, respectively (Dyck et al.2015) According to Barko ,Cremers and Ronneboog (2017) who studied investor activism promoting ESG improvements among 660 companies globally with higher market share, analyst coverage, stock returns, and liquidity over 2005-2014 found significant impact of good ESG track record on positive sales growth.

Evans, Peiris and Dinusha (2010) who researched on relationship between ESG factors and financial performance of US listed companies using a multifactor framework concluded a significant positive relationship between ESG ratings and both return on assets, market to book value measures. Feldman, Soyka and Amer (1997) investigated link between firms' environmental performance and stock price using 300 of largest public companies in US found companies those who commit investments in environment management systems beyond regulatory compliance increased shareholders value and observed that investments in environment management systems such as tools, methods, skill building within their workforce and implementing are costly but when appropriately evaluated many of these investments may provide substantial positive returns and thus maximizes shareholders wealth.

In an another important and interesting research by El Ghoul, Guedhami,Nash and Patel (2016) who studied the influence of media on firms' engagement in CSR activities over the period 2003 to 2012 using a large sample of 4,396 unique firms from 42 countries, found strong evidence that firms engage in more CSR activities especially where the media enjoy more freedom. Analysis also shows that employment conditions are a more relevant influence than other stakeholder criteria and a company's involvement in more general non-stakeholder related social issues contributes negatively to both operating performance and stock return (El Ghoul et al. 2016).

Followers of conventional view argue that environmental initiatives impose additional costs on corporations whereas Wagner (2010) and Ameer and Othman (2012) suggest such a sustainability efforts create a "win-win situation" by enriching performance and social welfare whereas Wagner and Wehrmeyer (2001) challenges both these views and supports an inverse U shaped relationship but McWilliams and Siegel (2001) researchers supports neutral association between firms' responsible behavior and resulting benefits. The inconsistency in results is also evident from the comparison of other empirical findings (Earnhart & Lízal, 2007).A survey conducted by Mckinsey in February 2010 from 1,946 executives across industries and regions concluded that more than 50% of CEOs factored corporate sustainability as "very" or "extremely" important for overall corporate strategy(Bonnis,Gorner & Jones 2010).

Eccles,Ioannis and George(2014) investigated the effect of "corporate sustainability on organizational processes and performance" observed that in a sample of 180 US companies, High Sustainability firms, boards who adopted sustainability policies by 1993, linked top executive compensation to sustainability metrics by 2009 whereas Low sustainability companies who did not adopt sustainability had no such evidence. High sustainability companies had high probability of establishing processes of stakeholder's engagement and significantly outperformed over low sustainability firms on the long run in terms of stock returns and financial performance (Eccles,Ioannis & George 2014).

Ioannis and George (2017) who examined implications of regulations mandating the disclosure of ESG information in China, Denmark, Malaysia, and South Africa observed that regulations improved sustainability disclosure driving increased firm valuations as reflected in Tobin's Q measure and

improving corporate value. On the contrary Eccles et al. (2014) concluded any forced ESG disclosure regulation on organizational processes would incur cost for the company, impacting firm's valuation negatively. Firms with higher ESG disclosure enjoy brand, reputation and access to finance (Bhattacharya and Luo 2006; Cheng, Ioannou & Serafeim 2014).

DATA AND METHODOLOGY

According to Sustainalytics the portfolio Sustainability Score is an asset-weighted average of normalized company-level ESG scores with deductions made for companies involved in controversial incidents, such as environmental accidents, fraud, or discriminatory behavior. Yearly data on variables executive compensation (EXECOMP), Return on Equity (ROE) and ESG scores of the firms were extracted from Sustainalytics, a global leader in sustainability analysis. This research focuses on studying relationship between ESG score and financial performance (ROE), executive compensation in firms listed in S&P 500, S&P/TSX markets for the years 2011 to 2015. After accounting for missing data a total of 646 companies are included in this research of which 477 US companies traded on S&P500 and 169 Canadian companies traded on S&P/TSX. Regression analysis is used to study the relationship between ESG as independent variable and ROE EXCOMP as dependent variables. The following hypotheses are tested using regression models.

H_1: Current year ROE is positively impacted by lagged ESG score.

$$\mathrm{ROE}_t = \text{constant} + \beta^{*}\mathrm{ESG}_{t-1} \quad (1)$$

H_2: Current year EXECOMP is positively impacted by lagged ESG score.

$$\mathrm{EXECOMP}_t = \text{constant} + \beta^{*}\mathrm{ESG}_{t-1} \quad (2)$$

RESULTS AND DISCUSSIONS

<u>H_1: Current Year ROE is Positively Impacted by Lagged ESG Score</u>

Investors and customers are expected to care for corporation's active involvement in improving environmental, social and governance aspects which translates into generating sales growth and thus better ROE leading to a greater executive compensation. ROE communicates how good a company is at rewarding its shareholders for their investment. First we examine the relationship between current year ROE with lagged ESG scores to study impact of ESG performance on ROE next year. Results of regression models are shown in table 1. In equation a, table 1 lagged ESG scores 2011 is regressed on dependent variable ROE 2012 and found that F statistic 9.651, beta value 0.121 is positive and significant at 1% level. Beta value 0.121 suggests 12.1% change in ROE for a unit change in ESG score. Though R^2 value is low and ROE is impacted by many other performance metrics of firm, ESG scores are found to be significant. In general there is a noticeable positive and significant impact of ESG scores on ROE over the years 2011 to 2015. In the regression models a to d as the F statistics, coefficients are significant concluding ESG score has a significant positive impact on ROE for the years 2012, 2013, 2014, and 2015. Thus regression results supports hypothesis H_1

<u>H2: Current year EXECOMP Is Positively Impacted by Lagged ESG Score</u>

Boards of public traded companies with geographically dispersed ownership are at a disadvantage in channeling company's executive's latent energies in maximizing shareholders wealth for which they are hired for. Executive compensation is an instrument for addressing such agency problem. Management strategic actions in implementing Environmental, Social and Governance mechanisms

invites Investors and customer's attention towards products and services they produce and expected to increase sales growth and sales turnover in subsequent years. Thus the relationship between current years EXECOMP with lagged ESG scores is examined. Results of regression models are shown in table 2. In model a, table 2 lagged ESG scores 2011 is regressed on dependent variable EXECOMP 2012 and found that F statistic 0.852, beta value -11469.96 is negative and not significant at either 1%,5% and 10% levels. But in model b lagged ESG scores 2012 is regressed on dependent variable EXECOMP 2013 and found that F statistic 0.6369 significant at 5% level, beta value 12545 is positive and significant at 5%level. Models b,c and d are significant and lagged ESG scores for the years 2012,2013 and 2014 shows a positive impact on EXECOPM next year. ESG scores has shown a significant and positive impact on EXECOMP variable.

Table 1: Regression Results

	Model	C	Beta [*t* Value] (Sig)	R^2	F (Sig)
a.	$ROE_{2012} = constant + \beta^{*}ESG_{2011}$	9.649	0.121 [3.107] (0.002)***	0.015	9.651 (0.002)***
b.	$ROE_{2013} = constant + \beta^{*}ESG_{2012}$	12.566	0.066 [1.715] (0.087)*	0.004	2.942 (0.087)*
c.	$ROE_{2014} = constant + \beta^{*}ESG_{2013}$	12.382	0.150 [2.373] (0.018)***	0.008	5.631 (0.018)***
d.	$ROE_{2015} = constant + \beta^{*}ESG_{2014}$	7.297	0.242 [2.529] (0.012)**	0.009	6.395 (0.012)***

*This table shows' regression results of impact of lagged Environmental, Social and Governance score on current return–on-equity. ***, **, and * indicate significant at 1% ,5% and 10% levels.*

In general there is a noticeable positive and significant impact on current years ROE is positively and significantly impacted by lagged ESG scores over the years 2012 to 2015. Current year EXECOMP is positively impacted by lagged ESG score is not supported for the year 2012 but evidenced support for the years 2013, 2014 and 2015.

Table 2: Regression Results

	Model	C	Beta [*t* Value] (Sig)	R^2	F (Sig)
a.	$EXECOMP_{2012} = constant + \beta_1{}^{*}ESG_{2011}$	1822717	-11469.96 [-0.923] (0.357)	0.006	0.852 (0.357)
b.	$EXECOMP_{2013} = constant + \beta_2{}^{*}ESG_{2012}$	1098493	12545 [2.524] (0.012)**	0.010	6.369 (0.012)**
c.	$EXECOMP_{2014} = constant + \beta_2{}^{*}ESG_{2013}$	1118682	13827 [2.878] (0.004)***	0.012	8.284 (0.004)***
d.	$EXECOMP_{2015} = constant + \beta_1{}^{*}ESG_{2014}$	1393271	11532 [2.386] (0.017)**	0.009	5.694 (0.017)**

*This table shows' regression results of impact of Environmental, Social and Governance score on executive compensation. ***, **, and * indicate significant at 1% ,5% and 10% levels.*

CONCLUSIONS AND RECOMMENDATIONS

Responsible Investment implies integration of ESG practices in firm's decision process. Investors and financial service professionals must pay attention to firms' controversial environmental practices or vulnerability practices from controversial supply management practices. Investments in firms Environment, Social and Governance systems require a significance financial investment on a continuous basis. This also requires a significant effort of management in identifying such sustainable practices. These investments are expected to create wealth to shareholders in subsequent periods as these impacts will be perceived by stakeholders. Thus a natural question is do investors or executives care such an Investment? This research paper focuses on sustainability reporting ESG score which measures companies Environmental, Social and Governance factors and its impact on investors return & executive compensation. Data on ROE, Executive compensation and ESG scores were collected for the years 2011 to 2015 on 646 publicly traded companies listed on S&P 500 and S&PTSX. Regression method is used to study impact of lagged ESG score on next year's ROE and executive compensation. Investigation suggests that ESG score of a year has an impact on next year's ROE. But the past scores of ESG collectively have no impact on ROE suggesting investors are not keen about historical scores of ESG but immediate near sustainability performance.

ESG scores of 2011 did not have any impact on executive compensation on 2012. However 2012, 2014 and 2015 has significant impact on executive compensation on subsequent years 2013, 2014 and 2015 respectively. This suggests that executives' pay is tied to achieving better suitability score otherwise executives are sustainable conscious are rewarded from 2012 onwards signaling that corporations start recognizing significance of achieving sustainability. This research concludes that investors do care for sustainability activism of the firm as it impacts ROE thus maximizing shareholders wealth and rewarding such executives for their active engagement in sustainability measures. More such research is encouraged using other investor's performance measures and size of the firm as investments in ESG activities are subject to financing scarcity. This research contributes to scarcely existing literature on sustainability and executive compensation and investors returns.

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BIOGRAPHY

The author Dr Sekhar Amba, Associate Professor at NYIT acknowledge the helpful comments of anonymous reviewers. My research interest includes sustainability, CSR, corporate governance, Investments, Corporate Finance and Leadership.Author may be contacted at smuni@nyit.edu

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IS CONSPICUOUS CONSUMPTION OF BUSINESS LEADERS JUSTIFIED AND MORALLY DEFENSIBLE?

Shaheen Borna, Ball State University, USA
Russell Wahlers, Ball State University, USA

ABSTRACT

Over the past couple decades as the accountability of corporate executives has been increasingly scrutinized, the popular business press contains numerous accounts of both corporate and personal spending excesses that have caught the attentions of shareholders, public policy makers, and the public at large. Conspicuous consumptions by corporate managers raises a wide range of issues. This paper attempts to provide some needed balance in understanding managers' behaviors by drawing some examples from both the historic and more contemporary literature on conspicuous consumption. In this paper, we first demonstrate that conspicuous consumption of corporate leaders can be justified from economic, marketing, and philosophical perspectives. Second, we present a religious perspective in order to provide a contracting view of the morality of conspicuous consumption. Our analysis concludes by offering a perspective rooted in balancing property rights, efficiency, and equity.

JEL: M1, M2, M3, M4

KEYWORDS: Conspicuous Consumption, Ethics

INTRODUCTION

The accumulation of wealth and its relationship to social status has historically played a significant role in many cultures. The mere possession of wealth was not sufficient for social status among the Kwakitutl Indians. To acquire such status, a public display of wealth was necessary. This usually took place within the framework of potlatch ceremonies during which the host gave lavish presents to his guests (Codere, 1950). The contemporary versions of the Indian potlatches are the parties of "the superrich." Examples include: dinners on horseback; banquets for pet dogs; hundred-dollar bills folded into guests' dinner napkins; a hostess seating a chimpanzee at her table; lightly clad maidens swimming in glass tanks or emerging from huge pies; cigars ceremoniously lit with flaming banknotes of large denominations (see also Horowitz 1985 and Brooks 1981); and well publicized Malcolm Forbes's estimated $3 million on celebrating his 70th birthday in Tangier Morocco on August19, 1989 (Alter, 1989).

More recently, David Bonderman, cofounder of TPG, spent $7 million on his 60th birthday party in 2002; Defense contractor David Brooks expended $10 million on his daughter's bar mitzvah in 2005 and Steve Schwarzman, co-founder of the Blackstone Group, spent around $5 million for his 70th birthday party in 2017 (Konrad, 2011, ABC News 2017, Sorkin, 2017). These are but a few well-publicized examples of lavish spending by high-profile corporate executives that have caught the attention of the public who increasingly questions this behavior. These practices have recently taken on added scrutiny in today's socioeconomic and political landscapes in which the disparity between the superrich and working class appear to be continually widening while the middle class appears to be shrinking. This paper attempts to examine this behavior of excess and provide a balanced theoretical understanding.

The literature provides several competing explanations that serve to aid in understanding the dynamics of excessive spending by the superrich. In this study, we establish that conspicuous consumption of superrich can be justified from economic, marketing and "philosophical" perspectives. However, from a religious point of view, rooted in the theologies of various faith practices around the world, in a society with many needy persons competing for even the bare necessities of life, such lavish expenditures are at best questionable.

LITERATURE REVIEW AND BACKGROUND

The term conspicuous consumption is not a new phenomenon. It was coined by the economist and sociologist Torstein Veblen in his book "The Theory of the Leisure Class" published in 1899. For Veblen, the term meant the ostentatious display of wealth for the purpose of acquiring or maintaining status or prestige. Veblen's theory has been revitalized in recent years by Duesenberry in 1967 by introduction of the concepts of "demonstration" or "bandwagon" effect. Mason (1981) related the conspicuous consumption to the "snob effect", i.e., consumers' desire to possess a unique commodity having a prestige value. Galbraith (1984) offered an updated version of Veblen's theory by stating that "simple forthright display is now out of fashion and is often referred to as vulgar; required instead is a showing of what may be called obtrusive good taste. That, unlike the conspicuous consumption of earlier times, requires a certain measure of artistic and even intellectual effort" (p. xxii). The results of a cross-cultural analysis of consumers' purchase of branded fashion accessories in Canada and Tunisia indicate that conspicuous consumption of consumers in both cultures is positively influenced by social status display and enhancement of consumer self-image. The same study also shows that conspicuous consumptions in individualistic cultures such as Canada is higher than in collectivist cultures (Souiden M'Saad and Pons, 2011). More recent works (e.g., Kastanakis and Balabanis, 2014), show how conspicuous consumption has changed from an exclusive behavior to mass consumption with the elitists fighting to keep it exclusive.

Between the extreme concepts of conspicuous consumption theories of "invidious distinction' behavior of Veblen and "bandwagon" or "keeping up with Jones" i.e., consumption enjoyed by masses (Page,1992), there is a plethora of national and international studies adding insight on consumers' conspicuous consumption. In countries like India, Vietnam, and Iran, just to name a few, despite the existence of conspicuous poverty, fashion is becoming a major attribute of conspicuousness. Consumers with superior taste but less money compete with those with money but not taste (the expensive dimension vs. the fashionability dimension) (Chaudhuri and Majumdar, 2006).

The nouveau riche in Iran display an insatiable appetite for luxury items such as Porsche automobiles, a gold Rolex or the latest 70-inch flat screen TV, often available through the black market and costing three times as much as in the United States. (NBC, 2014, see also Kermani, 2017). In Vietnam, rising wages as a result of strength in export manufacturing have provided the stimulus for conspicuous consumption among Vietnam's affluent class (Jennings, 2016). Of course, what is considered a luxury item in Vietnam (a mobile phone by Apple, a restaurant serving foreign cuisine, or a motor cycle by Honda and Yamaha) may be considered an ordinary item by US or European consumers. Interested readers in conspicuous consumption in China and India may refer to the Economist (2014) and Gill (2016) respectively.

An Economic Point of View

Irksome displays of wealth by the superrich frequently stimulate a rash of indignant public comment. There are many examples. "A New York Lady, for instance, having a nature of exquisite sensibility, orders an elegant rosewood and silver coffin, upholstered in pink satin, for her dead dog. It is made; and meanwhile a live child is prowling barefoot and hunger –stunted in the frozen gutter outside" (Shaw, 1894, p. 19). In this section, the notion of conspicuous consumption is examined from an economic point of view and it is concluded that communities that are more tolerant of this behavior are likely to be more successful in

providing high standards of living for their members. While the accumulation of wealth is something that most aspire to, people object when the winners dangle the evidence of their success before the eyes of the public. Despite this, pretentious displays of wealth have a considerable history and the aspiration of the current Yuppie generation suggests that this behavior will not end soon. The rub is that each of us would like to have more than we can possibly produce, and we are put off by the behavior of others when they appear to be wasteful of the things that, for us, are difficult to obtain.

John Locke was one of the first to suggest that the act of consuming might serve more than the satisfaction of narrowly defined utilitarian ends. Discussing the factors that influence the desire for certain goods, Locke suggested that "The contest and glory is in the expense, not the usefulness of it; and people are then thought and said to live well when they can make a show of rare and foreign things, and such as their neighbors cannot go to the price of" (Speigel, 1991, p. 162). Thorstein Veblen expanded on Locke's view. He suggests that the basis for one's self-respect is the respect accorded by others. Wealth is a magnet for this respect, but it is not enough to simply possess wealth. Wealth must be put in evidence. Wealth must be used in a conspicuous fashion, which necessarily implies an element of waste. The waste about which Veblen writes is evident in Shaw's parable on the New York leisure class mentioned at the beginning of this section.

Essentially, the above argument is a critique of private ownership and its attendant system of markets. It suggests that the institution of private property does not promote the wise and frugal use of resources necessary to maximize welfare. The above authors and others who subscribe to their view suggest that the State would do well to mitigate this undesirable effect by levying appropriate taxes on the wealthy with the proceeds distributed to the less fortunate (see, for example, Veblen, 2000). Despite the fact that Veblen was a trained and practicing economist and that his views continue to be embraced by some contemporary practitioners of the dismal science, his argument regarding conspicuous consumption has very little basis in economics. The argument is essentially ethical. It revolves around what people *should* want. If this differs from what they *do* want, Veblen identifies the consumption patterns as wasteful and suggests that a just policy would levy heavy taxes on such profligate behavior. Economics does not consider whether people should prefer "recitals of modern dance to spiked beer. Strictly speaking, words like *ought* and *bad* cannot occur in an economic discussion—at most one may say that an action is not appropriate to the end in view" (Stigler, 1942, p. 15, emphasis added).

The reason for assigning this limited role to economics is that matters of fact and logic can be resolved through free discussion and study, while differences of taste are not subject to such resolution. The subject of economics concerns the world as it is. Veblen, Shaw and others like them are more concerned with reformation than with the resolution of scientific issues. While economics has relatively little to say regarding Veblen's argument, a few factual points are important. The first concerns the assertion that the consumption patterns of the wealthy differ markedly from those of the poor. The accompanying Table 1 presents data on the percentage distribution of expenditures by category for those families whose incomes ranked in the highest 20 percent of all income earners in the United States compared to those families of average income. While the data indicate some slight differences in the percentage of the budget allocated to food and insurance, the distributions are remarkably similar on the whole. Despite the fact that the Bureau of Labor Statistics does not report expenditures on rosewood and silver coffins for canines as a separate luxury category, the data presented here are not consistent with the notion that the consumption patterns of the wealthy differ markedly from the rest of the community. None of this information denies the fact that the wealthy consume more of everything.

Table 1: Percentage Distribution of Expenditures – Family Income

Category	Highest 20 % Family Incomes	Percentage of Expenditures	All Family Incomes	Percentage of Expenditures
Avg annual expenditure	$158,896	100.00%	$57,311	100.00
Food	$16,054	10.10%	$7,203	12.57%
-At home	$7,135	4.49%	$4,049	7.06%
-Away from home	$8,919	5.61%	$3,154	5.50%
Alcoholic beverages	$1,659	1.04%	$484	0.84%
Housing	$46,076	29.00%	$18,886	32.95%
-Shelter	$28,041	17.65%	$11,128	19.42%
-Utilities	$6,534	4.11%	$3,884	6.78%
- Operations	$4,840	3.05%	$1,384	2.41%
- Furnishings	$5,484	3.45%	$1,829	3.19%
Apparel	$5,290	3.33%	$1,803	3.15%
Transportation	$19,029	11.98%	$9,049	15.79%
Health care	$9,137	5.75%	$4,612	8.05%
Entertainment	$8,262	5.20%	$2,913	5.08%
Personal care	$1,813	1.14%	$707	1.23%
Reading	$349	0.22%	$118	0.21%
Education	$6,743	4.24%	$1,329	2.32%
Tobacco	$204	0.13%	$337	0.59%
Miscellaneous	$2,301	1.45%	$959	1.67%
Contributions	$10,901	6.86%	$2,081	3.63%
Insurance premiums	$31,079	19.56%	$6,831	11.92%

U. S. Department of Labor. Consumer Expenditure Survey, 2016 Table 1203.

This may be viewed as conspicuous, obnoxious and wasteful to some. But differential rewards are spurs to progress. Highly productive and progressive economic systems have never been observed in egalitarian societies. If the front-runners chose to celebrate their success with public displays, we can either grumble in a corner with Veblen or we can celebrate the fact that the wealthy always scatter more crumbs than the poor.

A Business Point of View

Many examples of spending excess reported in the press involve corporate events held for the benefit of top executives and employees, favored customers, as well as high-profile celebrities and public policy makers. Business leaders justify their lavish parties mainly on three grounds. First, these events are used as conduits for promoting their business concerns. Parties and various entertainment events provide a business-relation (relationship marketing) opportunity with business leaders from United States and around the world. Spending on these events is often rationalized as a cost of doing business and has historically been treated as a valid business write-off under prevailing federal tax laws. Aside from serving a role in customer relationship marketing, lavish corporate spending by executives on gala events is probably the "purest" instrumental evidence demonstrating the success of their companies. Second, the parties provide an opportunity for capitalistic justification. As pointed out in the previous section, while wealth is a magnet for respect, it is not enough to simply possess wealth. Wealth must be spent in a conspicuous way. That is, the manner in which wealth is visibly used in excess is a key criterion in demonstrating business acumen. It would be unwise not to go through life enjoying it when a person has good fortune. In the following sections, the primary focus of discussion will be on conspicuous consumption as a public relation tool for promoting the business concern and as an opportunity for reducing tax liabilities of the organization. Several examples are cited concerning excessive corporate entertainment spending and its treatment under current federal tax regulations.

Entertainment as a Tax Write-off: Under Section 274 of the Internal Revenue Code of 1986, a portion (generally 50%) of expenses for entertainment are tax deductible if the corporate taxpayer can show that the amount of the expense for which a claim is made was "directly related" and "associated with" the active conduct of its business. The Code defines entertainment as an activity considered to constitute amusement,

recreation or entertaining guests at such places as night clubs, country clubs, sporting events, on yachts or on fishing boats, vacation and similar excursions. The nature of the taxpayer's business is an important consideration in the definition of "entertainment" expenses. For example, a fashion show would not quality as an entertainment expense for a dress manufacturer. The same activity is a legitimate entertainment expense if conducted by an appliance distributor for the spouses of his retailers. The main question in the definition of entertainment is whether or not the activity is directly related to the active conduct of business. According to Revenue Ruling 63-144, 1963-2 CB 129, the corporate taxpayer must show that: (a) it had more than a general expectation of deriving income from person(s) entertained and (b) it did engage in business during the entertainment. Further, this requirement does not necessarily mean that more time be devoted to business than to entertainment (c) the main character of the combined business and entertainment was the transaction of business.

Taxpayers can also deduct a signification portion of entertainment costs if the objective of the entertainment is to generate "goodwill" among business associates. From the IRS point of view, the entertainment expense should be "ordinary" and the circumstances considered to be conducive to business discussion. The main problem is how the terms "ordinary" or "conducive to business discussion" are defined and operationalized. The IRS does not provide specific guidelines in this case. The only stipulation is that the surrounding be such that there are no substantial distractions to business discussion. There is also the question of what constitutes a business discussion. According to the Revenue Ruling, there should be a substantial and bona fide business discussion. Whether a business discussion is "substantial" and "bona fide" depends upon the facts and circumstances of each case.

A question central to this paper is whether the law imposes any limits on deductions for entertainment expenditures that are considered to be "lavish" or "extravagant"? According to Revenue Ruling 63-144, "lavish" or "extravagant" expenditures are not allowed as tax deductions. Unfortunately, the IRS neither provides a definition of the term "lavish expenditure" nor establishes a fixed amount beyond which an expenditure can be considered "extravagant." In fact, entertainment provided at deluxe restaurants or first-class resort areas may be not be "lavish" if the "circumstances" of the case justify such expenses. In general, the Internal Revenue Service considers each case individually, and the decision will be based on "the facts and circumstances" of each case under consideration. It is very difficult to infer from the Revenue Ruling 63-144 whether or not the nature of the entertainment facility used and its location have any bearing on the question of what is "lavish" or "extravagant." Facilities such as a yacht, hunting lodge, and a home in a vacation resort can be used for entertainment purposes, but the costs of facilities themselves are not deductible as entertainment expenses.

The recently enacted "Tax Cuts Act" (H.R.1, TCJA) eliminates deductions for most entertainment expenses after 2017 (Code Sec. 274(a) (1). After 2025, deductions for employer-provide meals that are excludable from an employee's income will be disallowed (Code Sec. 274 (0). The new tax rules related to meals and entertainment does not clear up all confusions related to the old law. For example, the issue of whether business meals fall under the entertainment umbrella, or are still deductible (Russell, 2018), Business leaders might claim their birthday parties as "business entertainment" and deduct its expenses from their gross income. The amount of tax write-off will depend, in part, on the persuasive power of tax attorneys. The attorneys have to convince the IRS that the amount of the expense for which their clients are declaring as deduction was "directly related" to the active conduct of the business. Second, the attorneys have to demonstrate that the party was not lavish or extravagant. Whether the IRS will accept pigeon pie, grilled lamb, scented water and travel to Morocco as ordinary expenses is difficult to speculate at the present time.

Entertainment as a Vehicle for Promoting Business: Publicity involves "non-personal stimulation of demand for a product, service, or idea by means of commercially significant news planted in the mass media and not paid for directly by a sponsor" (Committee of Definitions, 1960). An advertisement in prime-time television may cost the company $400,000 to $500,000 per 30 seconds (Poggi, 2013) whereas a three-

minute report on a television newscast would not cost anything for the company. Some of the lavish birthday parties reported in the media are ostensibly highly successful publicity events for the business in questions. Taking into account all the airtime and newspaper space devoted to some of these parties, these entertainment events are probably among the most cost-effective publicity events compared with other paid promotional methods.

A Philosophical Point of View

Aside from taking a business point of view in examining conspicuous spending, it is also useful to consider this behavior from a philosophical perspective. Concerns about the morality of patterns of consumption have persisted since early in American history. The Puritans worried that material comforts, luxuries, and affluence were corrupting influences that would lead to self-indulgence, a loss of self-control, profligacy, and decadence. Their concerns have continued to the present (Horowitz, 1985). In examining the morality of conspicuous spending, a variety of ethical perspectives will be used, including Kantian, utilitarian, virtue, and consequential. The Act of Conspicuous Spending: The appropriateness or inappropriateness of various types of human behavior can often be judged by considering the nature of the act itself. Rape, for instance, is inherently wrong, minimally because it involves a lack of consent and violates personal autonomy in a severe way. But conspicuous spending does not appear to be inherently wrong. There seems to be nothing intrinsic to the *act* itself, as there is in rape that makes the act wrong. Some acts of conspicuous spending might even be praiseworthy. To bring attention to the poor in a region in India, Mother Theresa sometimes spent in a conspicuous way - - going to nice stores with reporters - - spending relatively large sum of money to raise some selected needy to the standard of living of the U.S. poor.

Her purpose was to raise the consciousness of Americans, so they will send more money to help the *foreign* needy, who are much more desperate than the U.S. poor. Even if we add that conspicuous spending is usually for inessential things and tends to be for personal glorification, it isn't clear that the *act* of conspicuous spending is wrong in itself. Early American moral philosophers worried that the consequences of consuming luxuries would be bad. While the act of conspicuous spending may not be inherently wrong, perhaps the consequences are bad. A Consequential View of Conspicuous Spending: A rule utilitarian approach to evaluating the morality of conspicuous spending would have us look at the *consequences of the practice* of conspicuous spending. As we moved toward a more consumer-oriented society in America during the 1800s, concerns were expressed about the consequences this would have. While there certainly were some bad consequences, the economic growth that resulted made a considerable positive difference. Consider a typical U.S. family in 1888. Most people worked on farms for 10-12 hours a day for 6-7 days a week, and earned about $1 an hour in terms of today's prices. They had no electricity, no running water, no toilets, and no central heating. Public health was rudimentary, and only a few safe and effective drugs were available to fight the many diseases of the time (Samuelson and Nordhaus, 1989). Compare that life with the everyday life we have now.

It is true that conspicuous spending was only a small part of the move to a more consumer-oriented society, so most of the beneficial consequences described above were due to general economic growth. But the purchase of what were then viewed as luxuries (cars, refrigerators, radios, TVs, etc.) contributed to this economic growth and the improvement of a family's life. There are several typical consequences of conspicuous spending that pull in opposite directions. For those engaging in conspicuous spending, it may be a way for them to demonstrate that they are successful, so that they may win the admiration of others and influence them. For some observers, this spending may constitute an incentive to work hard, save, and make careful investment, so they too can have more leisure, buy luxuries, etc. But for others, it promotes bitter envy, harmful competition, feelings of inferiority, etc. None of these consequences seem to so outweigh the others that we can decide in favor of or against allowing conspicuous spending.

Conspicuous Spending and Virtue Ethics: Another approach to the morality of conspicuous spending is to look at the type of person who engages in conspicuous spending, to look at some of the typical character traits of such a person, and to what motivates the person. A virtue is a character trait that is desirable because it contributes to the good of humans, while a vice is the opposite. From a virtue perspective, conspicuous spending may not be wrong, but it may reveal a defective moral character, a person who is less than our moral ideal. Let's concentrate on conspicuous spending primarily when it is for oneself. A person who tends to engage in this may have a variety of traits usually viewed as vices. The person may be rather selfish, that is, have an excessive concern for himself at the expense of others. Selfishness is viewed as a vice: something bad, not praiseworthy, to be avoided, a moral defect of character. In addition, the selfish person may have a cluster of related traits, all of which are vices. For example, he or she may be conceited, excessively proud, and self-glorifying. And because he or she is so self-centered, the person often lacks compassion and concern for others, is inconsiderate, feels superior and so lacks respect for others, and uses them as a mere means. Furthermore, underlying the conspicuous spending, the person may lack self-control and thus be self-indulgent, intemperate, ostentatious, and profligate. Again, these traits are viewed as vices. None of the above clusters of traits are found in the virtuous person. These are not traits we wish to inculcate in people. Who among us want to be around a selfish, self-indulgent, and inconsiderate person? These traits are inconsistent with Kant's principle that we are to respect people, including ourselves, and from the utilitarian perspective it is hard to believe that having these traits would maximize total welfare. People who sometimes engage in conspicuous spending when it is for themselves may not have these traits. But at least some of these traits are often associated with people who do. So again, it is not that conspicuous spending is problematic from a virtue perspective, but what it says about the person who tends to engage in it is worrisome, especially when so many desperately need our help.

From the proceeding discussions, we can conclude that from a business and economic points of view, business leaders' actions are justifiable, as long as no law is broken or transgressed. From a "philosophical" perspective, the *act* of conspicuous spending may not be inherently wrong. Lavish spending can have both positive and negative *consequences.* None of these consequences seem to outweigh the others that we can decide in favor of or against allowing conspicuous spending. From standpoint of *virtue ethics* conspicuous consumption is not problematic. It only reveals certain traits of the individual that are worrisome. If we cannot find something appalling about conspicuous consumption, then what is "wrong" in throwing an expensive birthday party? Are some unstated but nonetheless fundamental moral principles or rules of the marketplace broken by giving say a $7 million birthday party? In order to answer these questions, we subject our conclusions reached earlier to religious moral principles.

A Religious Point of View

The authors are cognizant of the fact that in the literature dealing with ethics, religious legalism is classified as deontological (rule) ethics. Exclusion of religion from philosophical points of view discussed in the previous section is arbitrary. The main purpose is to pro ide a contrasting perspective of morality of conspicuous consumption. While the purpose of this paper is not to compare and contrast moral principles espoused by various diverse religious faiths within the U.S. and throughout the world, most faiths in principle involve some universal, normative behavioral tenants that may offer a useful perspective in understanding conspicuous consumption. Religions both motivate individuals' acceptance of and justify societies' ethical demands and control systems upon their lives. One difficulty in using religion for a moral analysis is the pluralism of the world's religions. Even those which have been able to transcend particular cultures and thus deserve to be called "world" religions differ greatly in their view of the ultimate good (God) and of mankind's relationship to that "really real." Therefore, they approach ethical questions with diverse standards and varying emphasis. What is a major concern for one may be of minor importance to another. What is sanctioned by one may be denounced by another.

Social scientists, who study religions, as well as theologians within the religions, have struggled to find universal values affirmed by all religions. Anthropologist Kluckhohn observed that "No culture tolerates indiscriminate lying, stealing, or violence within the in-group…all cultures define as abnormal individuals who are permanently inaccessible to communication or who consistently fail to maintain some degree of control over their impulse life" (Kluckhohn, pp. 294-295). For this analysis, one moral principle found in negative form in Greek, Roman, Jewish, Buddhist, Confucian and Islamic literature will be used (McGray, p.145). Stated positively by Jesus, it is known among Christians as the Golden Rule. "As you wish that men would do to you, do so to them" (Luke 6:31 RSV). In Western religions (Judaism, Christianity, Islam), the Golden Rule is based on the character of the Creator God, who has chosen to reveal His purposes to humankind. Eastern religions (Hinduism, Confucianism, Buddhism) sometimes more agnostic about the nature of God, view the Golden Rule in more humanistic terms. For them, it is seen as a supreme means of finding harmony with oneself, others, indeed, with all of nature.

The Golden Rule and principles derived from it have been factors in philosophical approaches to ethics. For example, John Stuart Mill, the chief nineteenth century spokesman for utilitarian philosophy, once wrote "In the Golden Rule of Jesus of Nazareth, we read the complete spirit of the ethics of utility." Mill's central ethical doctrine, that is, the right thing to do is what produces the most good for the most people, dominated Western liberal thought throughout most of the nineteenth and early twentieth centuries. "To do as you would be done by, 'and to love your neighbor as yourself' constitutes the ideal perfection of utilitarian morality," he affirmed (McGray, p. 144).

While modern philosophers may debate both the validity of Mill's claim and also the ethical adequacy of the Golden Rule, it does provide an accessible construct for a religious critique of the super-rich affairs. The following analysis is admittedly written from a Christian perspective, but the principle may be found in the ethics of other world religions.What standards does the Golden Rule affirm for judging the morality of the lavish parties, and, in fact, all humans' actions? What guidance does it provide for determining our accountability for and to each other? First, the Golden Rule, in mandating the same treatment for other persons as oneself, upholds *justice* as a standard for judging the value of human behavior. Other persons are to be accorded what we desire for ourselves, neither more nor less. Ethical questions arise when a conflict of interest exists between two or more persons. To remove such conflicts, the principle of justice directs each individual to see in his own feelings and needs what would be good for others. It requires not sympathy but complete empathy or identification with the other. Furthermore, the individual is then commanded to act justly toward the other person to secure that same good that one wants for himself.

When this principle of justice is extended to a society, all persons are viewed as having equal rights. They are equal before whatever laws the society may have. They are due equal rewards and punishments for their actions. This application of the Golden Rule tempers the assertion that a person's value to a society should be based solely on his contribution to the society. Many are unable to make equal contributions because of differences in ability, education, handicapping conditions, or patterns of discrimination; yet they deserve to have their needs met and to be respected as human beings of equal worth and dignity. Appeals to justice have resolved conflicting claims regarding the possession and use of private property. The world's religions, by means of the Golden Rule, assert that because all persons have intrinsic value, they have a prior moral claim to material assets which others, because of greater power and ability, may consider to be their own. Because of mankind's finiteness, such possession is temporary. Consumption beyond one's needs is condemned by the Golden Rule on the grounds that it neglects the needs of others by using limited resources. The actions of people, who indulge themselves by squandering these limited resources, are to be viewed as morally degenerate. The just person and the just society see that the needs of the poor, the handicapped, the widowed, the orphaned, and even the outcast or alien, are also to be attended to. To do otherwise is to make wealth and its consumption rather than persons the ends of our actions. This judgment is clearer when the Golden Rule is seen in its negative form. When we view people as unworthy, we risk being held in the same contempt by others. We thus run the danger of becoming dehumanized also.

We, too, may be viewed as the means to some higher good for some greater power. Modern history is replete with examples of persons who, when failing to stand for justice, were later treated unjustly. Christians under the Third Reich in Germany, who refused to demand justice for Jews, later found themselves victims of the same unjust, inhumane, arbitrary treatment that the Nazis had created for the Jews. The Golden Rule, in providing a basis for justice, not only demands that each individual treat others with the same fairness that one expects for oneself but also that societies should order their laws and institutions to provide for the well-being of all its members. The Golden Rule is a means for holding people accountable so that the good of all may be provided for as a basis for a stable social order.

A second ethical principle implied in the Golden Rule is that of *mercy.* Since the actions of all persons at some time fall short of their ideals, whether that of justice or another principle of more parochial nature, we do not always want what we deserve. We desire instead to be forgiven, to be given another chance, to be treated with *mercy*. "Forgive us our debts as we have forgiven our debtors" is a well-known phrase in what Christians call the Lord's Prayer. It specifies another way that the Golden Rule may apply to our lives. In addition to the reciprocal call for equal treatment – in order to receive, we must be willing to give – the principle of mercy in some religions provides individuals opportunity to balance off their own failings in one area with acts of mercy in another area. Alms giving and acts of charity are frequently viewed as meritorious. Forgiveness in these religions is something which may be earned or demonstrated by restitution. In the Jewish book of laws, Leviticus, the offender, was to pay back his victim in full plus twenty percent more and to bring a guilt offering to the priest, then "he shall be forgiven for any of the things which one may do and thereby become guilty" (Leviticus 67 RSV).

The Golden Rule is a reminder that the mercy we desire for ourselves must be extended to others. Although mercy is primarily a means of restoring relationships between individuals, its possibility may be enhanced by public policies in society. An example is seen in the Leviticus 6 passage above. A kinder and gentler society encourages and rewards acts of mercy. A third virtue or principle advanced by the Golden Rule, and espoused by many religions, is labeled *humility*. Often misunderstood as putting oneself down, humility, rather, is viewing oneself realistically. In spite of differences of possessions, status, temporal power, or even religious achievement, treating others as we wish to be treated makes us equal before each other and the higher powers. Our ability to look up to others or look down on others is at best only temporary. We are to think of ourselves as intrinsically no better and no worse than others. Social harmony is furthered by recognizing this sooner rather than later. Humility, seeing oneself of equal status with all others, provides a reminder to the powerful not to think of themselves "more highly that they ought to think (Romans 12:3) and encourages 'the meek' to be assertive, to persist for they 'shall inherit the earth" (Matthew 5:5). The Golden Rule thus provides a check on the human tendency toward arrogant use of power, whether economic, political or even moral. Power is not inherently evil, but its use may be. Possession of power has a way of causing the possessor to feel exempt from the controls under which the less powerful must live. Charles Colson, President Nixon's legal counsel, in reflecting on his Watergate experiences, wrote "I saw how the White House transformed young political idealists into prideful supermen, myself included. The same thing can happen to the prestige-conscious businessman, the bullying shop steward, the dominating parent" (Colson, p. 38).

Humility is a reminder that in making a decision, the rights of others are more important than our ability to coerce them. We may not always have such power; and if powerless, we will still wish to be treated with respect and dignity, whether or not others may think we deserve it. The egalitarianism of the Golden Rule is expressed in the virtue of humility. In light of this social accountability role of religion as expressed the Golden Rule, how should we view the extravagant parties of the superrich? Conspicuous consumption is obvious in the aforementioned birthday parties of business leaders. The sense of justice in human hearts for fair and equal treatment sooner or later results in such outrage over such conspicuous consumption in the face of human poverty that it contributes to public support for political change and economic confiscation.

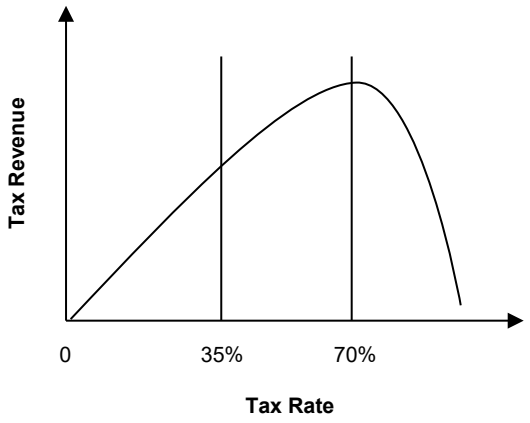
Not only are business leaders' actions called into question by their failure to use wealth to further justice, but also by their views of themselves. Even though they may argue that they are deserving – because of their wit, hard work, ability to organize others or what not - to enjoy the fruits of their labor. The standard of humility challenges this view of themselves. A just society is built on individuals who wish not only to be honored themselves but also those who are willing to accept an obligation to honor all members of the society who see others not as means for self-adulation but as ends for their own sakes.

Less obvious is the business leaders' manipulation of the tax system and the media. Guest lists consisting largely of executives of companies with whom the hosts have business interests, allow the costs of privately-held companies to be passed on to the public via the vehicle of a tax-deductible business expense. Further, leaders' media interests are furthered by the presence on the numerous reporters from around the world. The business leaders co-opt the press in a very sophisticated way. In a society based on the equality of political rights, journalism's ability to be revelatory and accurate is an important means of holding persons accountable. When people know, they may make better decisions. They, thus, can utilize the standards of justice, mercy and humility. Do leaders' hanky-panky with reporters foul the wells of journalistic accuracy for the reporters' publications? Are media organs, whose reporters attend the lavish parties at hosts' expense, less able to provide accurate accounts of leaders' actions, so that all of us in a democratic society can hold them accountable through public opinion and by means of law? The Golden Rule, as a representative ethical standard of the world's religions, raises these and other related questions about the morality of the business leaders' use of wealth, manipulation of media, as well as their compassion for the suffering and needy in society.

A PATH FORWARD

With the concept of morality and its roots in religion serving as a balancing perspective between economic and business theories to aid in understanding the notion of conspicuous spending, several additional concepts are worthy of mention. The intertwined concepts in the aforementioned discussions of the morality of conspicuous consumption are: property rights, efficiency, and equity. Property right is defined as "the exclusive authority to determine how a resource is used, whether that resource is owned by the government or by individuals" (Alchian, 2008). In the capitalistic societies, the exclusive authority for using resources (with certain restrictions) resides with the individual. It is argued that the "invisible hand" of the free market economy will produce the most desired and beneficial goods in the most *efficient* manner possible at the lowest prices possible. The main weakness of the invisible hand concept is that it ignores negative externalities, asymmetric information of consumers about products, and more relevant to our paper, individuals' willingness to pay more for one good rather than another for a desire to conspicuous consumption. Finally, unrestrained markets usually lead to inequality in the society. Under socialism, government agents exercise control over resources. This model may achieve the goal of equity. However, it is proved that governments in general are not good businessmen, i.e., government run enterprises are usually inefficient. There is plethora of competing arguments for ameliorating the two extreme forms of private property ownership. In order to limit the scope of discussion, we will only consider the economic as well as religious aspects of taxation. One solution for reducing inequality is the progressive taxation. A tax is called progressive when the government takes from high-income people a larger fraction of their income than it takes from low-income people. The effect of progressive taxation on capital income is not very clear. Tax payers in higher tax brackets may invest in less productive activities, such as growing trees, tax exempt municipal bonds, and so on. The most talked about disincentive effects of high marginal tax rates is a movement called the *supply-side school*. The famous Laffer curve in Figure 1 shows that as the tax rates rise from zero, total revenues rise and then at some point they decline. Of course, not all economists unanimously endorse the concept behind the Laffer curve.

Figure 1: Laffer Curve



An asymmetric Laffer curve with a maximum revenue point at around a 70% tax rate, as estimated by Trabandt and Uhlig (2009).

Similar to secular societies, almost all theocracies have recommendations for reducing inequality among their followers. For example, *Khums* and *Zakat* are both among the obligatory principles of Islam that are considered solutions for reducing inequality and financial problems in the Islamic societies. Khums obligates a Muslim to pay one-fifth of what has remained from his income after subtracting his own expenses to needy individuals. Zakat is another type of compulsory tax on nine things: camels, cows, goats; wheat, barley, dates, raisins; gold, and silver coins. While rooted in the objective of distribution of wealth to those in need, there is no conclusive evidence supporting the effectiveness of these taxes in reducing inequality and financial problems in Islamic societies. Perhaps the Nordic Model practiced in countries such as Sweden, Norway, Denmark, and

Finland is a path forward, as a benchmark, for a satisfactory, if not and ideal combination of efficiency, private property and equality. Studies indicate that the Nordics succeed better than other countries in combining economic efficiency and growth with a fair distribution of income and social cohesion. The model is also described as a source of inspiration for other countries in their search for a better social and economic system (Anderson, et al., 2007).

CONCLUDING COMMENTS

Ethics in business is an inexact art. Amidst the current pluralism of values and perspectives, a dialogue among participating interests is helpful if not essential. In this paper, the authors examined conspicuous consumption as exemplified in the lavish birthday parties of business leaders. Their comments apply to the person making a conspicuous spending decision as an individual, a corporation or a civil public. The more objective disciples of economics and business management supply necessary information about some of the circumstances and likely consequences of possible actions. Philosophy can assist by clarifying concepts and adding analytical precision to the process. Religion reminds that transcendent values are present in the situation and within the persons engaged in making the decision or in evaluating it. Human actions are, in the final analysis, moral whether at the level of public policy or corporate or personal behavior. They are ultimately decisions that persons singly or corporately make as they take the risk of responsibility for their actions. In this instance, an act of conspicuous spending was seen to be not necessarily wrong in itself. It is likely consequences economically and politically are mixed.

In the context of society with many needy persons trying to obtain even the necessities for life, lavish, conspicuous spending is at best questionable. The values of justice, mercy and humility, whether they are

held to be human or transcendent, further question its morality. When persons make economic decisions to engage in conspicuous spending, traits of character are revealed which may be worrisome to others. Accountability may be demanded sooner or later at the bars of public opinion or political process. In discussing the concept of conspicuous consumption behavior, this paper has focused primarily on the behavior of business managers acting as individuals. An interesting issue for further consideration would be an extended discussion of corporate executives' behavioral spending excesses acting as organizational agents of their respective firms. Such a needed discussion would extend the debate beyond opinions and perceptions of the general public as a social/ethics concern and involve the perspectives of corporate stakeholders including employees, shareholders, and others within the financial and public policy communities.

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BIOGRAPHY

Shaheen Borna is Professor of Marketing at Ball State University, USA. He earned his doctoral degree in business administration from Florida State University. His research interests include business ethics, retail location, promotion, and new product management. His teaching interests include marketing management, consumer behavior, business ethics, international marketing, and retailing. He has published numerous articles in The Journal of Business Ethics, Journal of Services Marketing, Journal of Young Consumer*s,* Journal of Global Business, International Journal of Advertising, Higher Education Management, International Journal of Public Policy , International Journal of Management and Marketing Research, The Journal of Health Care Marketing, British Journal of Criminology, Journal of Accountancy, Journal of Health and Social Policy, Journal of Teaching Business Ethics, and Higher Education Management among others.

Russell Wahlers is Chair and Associate Professor of Marketing in the Department of Marketing at Ball State University. His research interests include consumer choice models, marketing communication, and marketing education. Teaching interests include marketing research, marketing simulation, and promotion. Professor Wahlers' articles have appeared in Marketing Education Review, Journal of Marketing Theory and Practice, Advances in Consumer Research, Review of Business, Journal of Marketing Communications, Journal of Promotion Management, International Journal of Information and Operations Management Education, Academic Exchange Quarterly, Journal of Leisure Research, and Journal of Travel Research.

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ENVIRONMENTAL STRATEGY AND COMPETITIVE ADVANTAGE IN MEZCAL BUSINESSES IN OAXACA, MEXICO

Ileana García-Román, Instituto Politécnico Nacional Oaxaca, México
Patricia S. Sánchez-Medina, Instituto Politécnico Nacional Oaxaca, México
René Díaz-Pichardo, South Champagne Business School, France & Université de Technologie de Troyes
Magdaleno Caballero-Caballero, Instituto Politécnico Nacional Oaxaca, México

ABSTRACT

In this article we examine the relationship between environmental strategy and competitive advantage using natural-resource-based theory. We did a transverse-cut quantitative analysis on a sample of 80 small mezcal (distilled alcoholic beverage made from agave angustifolia haw) businesses in Oaxaca, Mexico. We used structural equations modeling for hypothesis testing; our results reveal a direct and positive relationship between environmental strategy and future positioning, and between environmental strategy and business partnerships. This implies that environmental strategies implemented by the palenquero (the owner or manager of a mezcal business) can generate competitive advantages in future positioning and partnerships, which improve business productivity and help preserve the natural environment.

JEL: M1, M14

KEYWORDS: Small Businesses, Mezcal, Environmental Strategy, Competitive Advantage

INTRODUCTION

Micro, small, and middle-sized enterprises (MSMEs) are of great importance for the Mexican economy. They contribute 52% to the GDP, generate 64% of employment, and represent 95% of formally registered firms (INEGI, 2009). In the State of Oaxaca, MSMEs represent 99.8% of the total number of firms. Mezcal businesses are part of this percentage (DENUE, 2016), and even though they contribute 197.97 million pesos to the Oaxaca's GDP (INEGI, 2012), there are few studies on this sector. Studies mainly cover the optimization of maguey production in some of its stages (Pérez, Caballero, Hernández and Montes, 2013); or the way mezcal businesses conduct their marketing activities to achieve the observed productivity level (Hernández and Domínguez, 2003). At an international level, the relationship between environmental strategy and competitive advantage has been studied since the 1980s, when management theorists debated the importance of internal capabilities in firms when compared to environmental factors in the generation of competitive advantages, as well as the traits businesses must have in order to become sustainable in the future (Hart, 1995).

In the present competitive context, the environmental variable plays an important role in the potential to alter the competitive position of businesses in a determinate economic sector (Armas-Cruz, 2011); thus, management of the environmental variable is a strategy in the creation of competitive advantages. According to Freel (2005), this factor (in combination with innovation) can reduce the uncertainty faced by companies since care of the environment can be present in each area of a company and is a very important factor when talking about strategies that look for sustainable competitive advantages. The relationship

between environmental strategy and competitive advantage has been studied from multiple perspectives. Some have identified environmental regulation as a challenge and introduced it as an environmental strategy in order to achieve competitive advantages (Barrett, 1991). Others have found that sustainable development is possible through readjusting energy and technology use from an ecological perspective (Shrivastava, 1995). Business production has also been analyzed in terms of implementation of environmental strategies, from which an improved reputation, competitiveness, and competitive advantages can be obtained (Miles and Covin, 2000). In this way, environmental strategy can be a key factor at the organizational level (Hernández, De Jesus and Aguilar, 2013).

There are studies that analyze the dynamic capabilities of businesses in implementing environmental strategies with the purpose of creating competitive advantages in an environment of increasing uncertainty (Aragón-Correa and Sharma, 2003). Likewise, environmental strategy and competitive advantage have been studied through better practices within firms, which allows for improved organizational capability and greater employee experience (Claver, López, Molina and Tarí, 2007). The relationship between environmental strategy and competitive advantage has also been studied through the incorporation of innovation as an element that positively influences the general and environmental strategies of a business, generating competitive advantages (Wagner, 2009). This same relationship has been analyzed from the standpoint of environmental improvement, considering that environmental strategies lead to the development of competitive advantages (Marchi, Maria and Micelli, 2013).

It is worth noticing that the studies mentioned above were done on large firms in industrialized economies like those of the United States and European countries and consequently, there is a gap in the literature regarding micro and small businesses in developing countries; added to this, it is often thought that micro and small businesses lack resources to implement environmental strategies because they are focused on subsistence in most cases (Toledo, Díaz-Pichardo, Jiménez and Sánchez-Medina, 2012). According to Hart (1995), competitive advantages are based on assumptions of heterogeneity and immobility of resources within Barney's (1991) resource-based view (RBV). These resources must be able to generate value by exploiting opportunities or neutralizing existing threats in the business environment; they must stand out among actual and potential business competitors, be difficult or impossible to copycat by competitors, and must not have strategically equivalent substitutes. Furthermore, the natural-resource-based view (NRBV) illustrates the challenge of incorporating the environment into business strategies by way of three interconnected strategic capabilities: pollution prevention, cost reduction of a product during its lifetime, and sustainable development. According to Hart and Dowell (2011), the latter strategic capability, sustainable development, is divided into clean energy strategic capability and strategic capability for the base of the pyramid. In a larger sense these capabilities refer to an environmental strategy implemented by the firm. The objective of our research is to analyze the relationship between environmental strategy and competitive advantage using Hart's NRBV (1995). It empirically contributes to the literature by studying micro and small businesses in developing countries, which are usually themselves in a context of subsistence within the base of the pyramid; such is the case of mezcal businesses in Oaxaca.

From the strategic capabilities proposed by the NRBV, the strategic capability of product management is increasingly being studied. The study of mezcal businesses helps to consolidate research on the creation of partnerships between the *palenqueros* and other stakeholders like the government, the local community, the suppliers, and non-profit organizations, which contribute to the improvement of the product's life cycle, in both economic and environmental terms. In the literature, clean energy strategic capability has been poorly studied in recent years. Disruptive changes implemented by some *palenqueros* can be an interesting aspect for research on this specific capability. From these changes we can see that investment in technology and implementation of new techniques that allow for improved use of raw materials, energy, and water, thus reducing waste and costs, provides better positioning for the future.

The following research question arises: does environmental strategy generate competitive advantages in Oaxacan mezcal businesses within the NRBV framework? The rest of the paper explains briefly the Natural-Resource-Based View, followed by a description of the context in which mezcal businesses develop, after which we propose our research hypotheses. Later, we explain the methodology used to test our hypotheses, discuss research results, and present our conclusions.

LITERATURE REVIEW

The Natural-Resource-Based View (NRBV) stems from the Resource-Based View (RBV) proposed by Barney (1991). The view suggests that the optimum combination of a firm's resources and capabilities can be key to developing a sustainable competitive advantage. However, RBV leaves aside the environmental aspect and ignores ecological problems such as air and water pollution, global warming, and toxic emissions. Hart (1995) noticed that if firms continue to practice the same strategies, irreversible damage upon the basic ecological systems of the planet will take place. He proposes new challenges for the firm's strategic management, which must be environmentally sustainable. Hart (1995) argues that economic activity, business strategies, and competitive advantages must ease environmental sustainability. Fifteen years later, Hart and Dowell (2011) revise the NRBV and redefine sustainable development, which can be explained through clean technologies and the base of the pyramid. The revision suggest four strategic capabilities included in the NRBV as shown in Table 1.

Table 1: A Natural Resource Based View: Fifteen Years After

Strategic Capability	Driving Force	Key Resource	Competitive Advantage	State of Developed Research
Pollution Prevention	Minimization of emissions, sewage waters, and waste	Constant improvement	Reduced costs	Solid empirical evidence in favor of NRBV
Product Management	Minimization of the costs of product life cycles	Stakeholder integration	Reputation and legitimacy	Increasing areas of research, but still much to achieve
Clean Technology	Make improvements to quantum leap	Disruptive change	Future positioning	Scarce research up to now
Base of Pyramid	Satisfy unsatisfied needs of people in poverty	Implementation of innovation	Long-term growth	Growing body of practice and orientation, need of academic attention

This table shows the strategic capabilities derived from the vision based on natural resources. Each strategic capability entails a particular competitive advantage, as well as key resources in which each capability is focused and particular areas of action that are its driving force, finally showing the state in which the research development is located for each developed strategic capacity. Source: Hart S., & Dowell, G. (2011). A natural resource based view of the firm: Fifteen Years After. Journal of Management, 35(5), p.1472.

Pollution prevention can be achieved by controlling polluting emissions, either by catching, storing, or eliminating them; by using control equipment; or by preventing emissions, reducing them by improved cleaning, substitution of materials, recycling, or process innovation (Cairncross, 1991; Frosch and Gallopoulos, 1989; Willig, 1994). This strategic capability requires active participation from employees and continuous improvement of emissions reduction, contrary to what is thought of as expensive technological equipment to control pollution. By preventing pollution, not only can savings in installation and operation of control devices be achieved, but also productivity and efficiency are increased because inputs are being better used, therefore reducing costs of raw materials and waste elimination (Young, 1991). Pollution prevention reduces overall costs and improves the firm's cash flow and profitability (Hart and Dowell, 2011). This capability is not procured by the artisanal mezcal sector because the *palenqueros* are not concerned with preventing pollution; they are more concerned with focusing on positioning or maintaining themselves in the market. Product management is concerned with every activity along the value chain, from the entry of raw materials to the use of the product. There is environmental impact at each stage

of the value chain; environmental concerns must be integrated into each stage. Reducing the environmental costs of product management requires minimizing the use of non-renewable materials, avoiding toxic materials, using renewable or low-environmental-impact resources in product elaboration, and ease of reuse or recycling at the end of its useful life (Kleiner, 1991; Shrivastava, 1995; Hart, 1995).

Firms can eliminate or modify activities in their product management processes that deteriorate the natural environment; for instance, redesigning existing products, and developing environmentally-friendly products and packages. This strategy suggests that, in order to minimize environmental impact, the firm must take a proactive stance towards environmental protection in its use of raw materials, as well as in the components used from suppliers (Smart, 1992). Product management can lead to the development of competitive advantages if privileged relations are created by having exclusive access to certain products or by the establishment of certain rules that generate advantages for the firm (Hart and Dowell, 2011). In the context of mezcal businesses, partnerships between *palenqueros* and the government have generated the possibility of access to new technology and knowledge that encourages a better use of resources; competitive advantages can be generated that allow mezcal businesses to have greater possibilities in future positioning. From Hart and Dowell's contribution (2011), strategic capability of sustainable development can be subdivided into clean technology and base of pyramid (BOP) strategic capabilities. Clean technology strategic capability emphasizes that firms should build new skills that put them in an advantageous position in the market (Hart, 1995; Hart and Dowell, 2011; Sánchez-Medina, Díaz-Pichardo and Jiménez, 2015). Among mezcal businesses, by implementing different forms of technology that allow water and energy savings at different stages of production, different environmental strategies have been generated within the clean technology strategic capability.

Some mezcal firms, with the purpose of improving maguey use, have implemented technology such as maguey mills that grind the already baked maguey *piñas* (or hearts) in a more homogeneous manner; mills obtain more and better sugars during the baking stage; the construction of closed rooms maintains an adequate temperature in the fermenting tubs; and during the distillation stage, cooling towers allow for reuse of water. With all the changes that have occurred in the mezcal business, *palenqueros* could achieve a more competitive market position and better resource utilization, which in turn increases their possibilities for future positioning. Strategic capability at the base of the pyramid focuses on people's poverty in developing countries (Hart and Dowell, 2011). The poverty and marginalization context in which mezcal businesses develop fits into this capability. By improving the living conditions of *palenqueros*, improvements on the quality of life of mezcal business owners and workers alike are encouraged.

These strategic capabilities relate to each other in the following manner: in pollution prevention, polluting emissions, sewage waters, and waste are minimized, which leads to cost reductions; product management minimizes costs during the product's life cycle, and the firm obtains greater prestige; outpacing competitors and sustainable development both allow for future positioning. The NRBV suggests a relation between environment and business activities: considering the natural aspect in the firm's strategies, sustainable competitive advantages can be obtained. Pollution prevention strategies focus on continually improving production processes and involving employees in "green" teams; likewise, these strategies are related to the objectives of total quality management since they seek to reduce material waste, effort, and time, achieving a competitive advantage in costs. Product management strategy displays a functional management of the firm, affecting production, design, and employee coordination and involving several stakeholders inside and outside the firm; competitive advantage in terms of prestige is achieved.

Finally, strategic capability at the base of the pyramid proposes that development should be inclusive by taking into account economic aspects and the environment in the firm's activities, and by involving social aspects when considering marginalization of less developed countries. Considering that the NRBV starts from the strategic capabilities a firm is able to develop, including environmental concerns that lead to competitive advantage, it is possible that mezcal businesses can find an alternative for future positioning

through improved production processes that reduce their negative impact on the environment. Greater environmental care during the whole product life cycle leads to competitive advantages and a fair market that allows for sustainable businesses.

Context of Mezcal Businesses

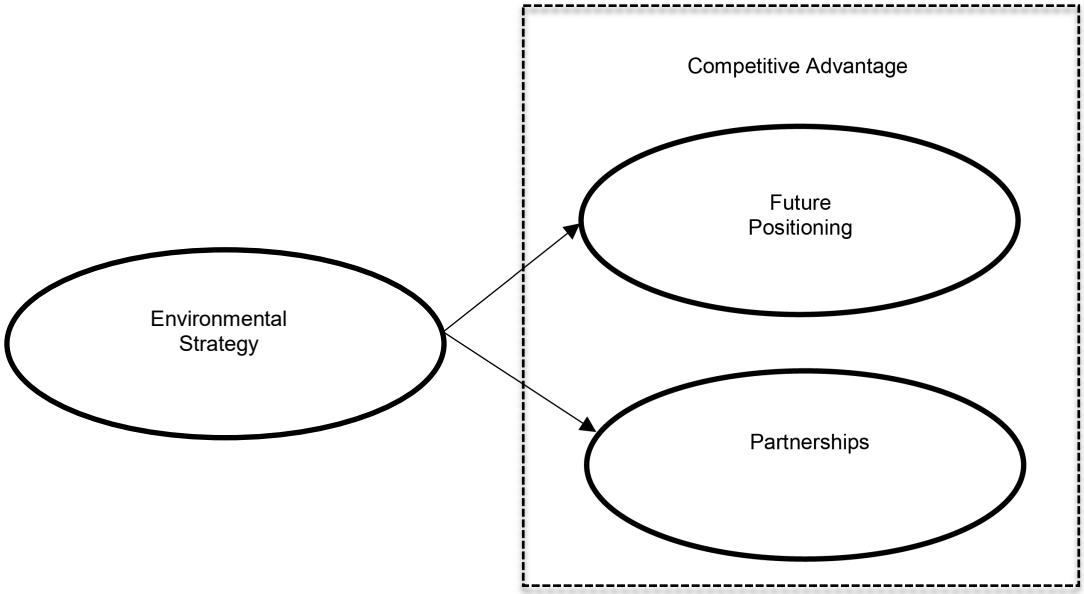
The State of Oaxaca is one of the states that has appellation of origin for mezcal production. Sola de Vega, Mihuatlán, Yautepec, Tlacolula, Ocotlán, Ejutla, and Zimatlán are some of the producer districts in the region; they are located in the Valles Centrales and Sierra Sur regions. These districts contribute 85% of local mezcal production. Mezcal production in Oaxaca is done in a traditional manner; it is relevant to know the characteristics of the producers and the climate conditions—the quality of mezcal depends on climate conditions. The Valles Centrales region in the State of Oaxaca is characterized by high levels of marginalization and extreme poverty. Mezcal producers often have low wages, minimal education, and are malnourished, with multiple health issues. Low income and precarious housing conditions lead to low levels of production, unemployment, underemployment, and migration. There is a wide gap between existing technology and its use. According to Bautista and Ramírez (2008), agroclimatic conditions are relevant to *mezcalero* agave production. Temperature and rainfall significantly influence the development period and quality of crops. Practically speaking, this is a rainfed agroindustry because it lacks irrigation infrastructure as well as other conditions that might improve the quality of agave.

Traditional production is based on knowledge transmitted from generation to generation. New elements have been incorporated to improve the preparation of agave distillate, but retain the system learned from previous generations. The preparation process of mezcal involves four stages: the baking stage, the grinding stage, the fermentation stage, and the distillation stage. In the baking stage, agave hearts are placed in a natural oven consisting of a circular excavation that forms a large bowl covered with stones previously heated with firewood until they are red hot; the process lasts four days. In the grinding stage, the baked hearts are cut into homogeneous pieces and ground in Egyptian traditional mills, with a large round stone using animal traction. In the fermentation stage, the resulting must or juice is poured into wooden tubs where it ferments naturally for four or five days, depending on the average temperature. Finally, in the distillation stage, double distillation is done to obtain a more natural, homogeneous, and high-quality alcohol. The importance of studying environmental strategy implementation in Oaxacan mezcal businesses and the generation of competitive advantages lies in promoting environmental concern in these businesses. Furthermore, by implementing these strategies, alternatives can be reached that improve the quality of life of *palenqueros*. Considering the above arguments, we have formulated the following research hypotheses:

> *H1: There is a direct and positive relationship between environmental strategy and future positioning of mezcal businesses.*
>
> *H2: There is a direct and positive relationship between environmental strategy and partnerships between palenqueros in mezcal businesses.*

We propose the following research model (Fig. 1). Environmental strategy implemented by mezcal businesses leads to the generation of competitive advantages; i.e., future positioning and formation of partnerships.

Figure 1: Proposed Research Model for Mezcal Businesses



This figure shows the graphical representation of the theoretical research model, which indicates the direct and positive relationship between environmental strategy and future positioning and between environmental strategy and partnerships. The direction of each arrow indicates the relationship and the hypothesis raised in the model. Source, own elaboration derived from the review of the literature.

DATA AND METHOD

Sample and Unit of Analysis

A representative random sample of 100 mezcal businesses from municipalities with higher production and easier access was selected from 221 mezcal businesses in the state of Oaxaca, according to the National Statistical Directory of Economic Units (DENUE, 2015). Of the 100 questionnaires obtained, 80 included complete information from respondents, representing a response rate of 80%. A survey was applied for data collection, this survey was administered in April and May 2015 to owners or managers of selected mezcal businesses. It was administered via a face-to-face interview guide in an average time span of thirty minutes. The questionnaire consisted of a total of 57 questions divided into sections such as general data, environmental strategies implemented, and competitive advantages generated as a consequence of these strategies. The municipalities are shown in Table 2.

Table 2: Characteristics of the Sample

Municipality	Number of Businesses
Tlacolula de Matamoros	40
Santa Catarina Minas	6
San Antonio Huitepec	3
Villa Sola de Vega	13
Zimatlán de Álvarez	9
Miahuatlán de Porfirio Díaz	4
Asunción Nochixtlán	5
Total	80

This table shows the number of businesses per municipality included in the sample. The selected municipalities correspond to those of greater mezcal production at the state level, also taking into consideration those of easier access for the collection of the information. Source: Elaborated by the authors based on DENUE, 2015.

The unit of analysis is the mezcal-producing business. The response units are the *palenqueros*, and mezcal business owners and managers.

Variables and Measures Used

The *environmental strategy* variable is defined as those actions done—even involuntarily—by the *palenqueros* in benefit of the environment during the processing and commercialization of mezcal; actions that improve the life cycle of the product and/or sustainable development—clean technology and base of pyramid. Sustainable development is achieved by the implementation of clean technology. Dimensions and indicators used to measure this variable were chosen according to our observations and conversations held with *palenqueros* during the interviews. Scales developed by Sharma and Vredenburg (1998) and Sharma (2000; 2001) were useful as guides to build a scale relevant to the traditional mezcal context. Questions that worked properly in the structural equations model are those related to water use in the production process and improvement of electrical installations. We used a 5-point Likert-type scale, asking *palenqueros* about the reduction of water use in the last year. Answers go from 1 (nothing) to 5 (very much).

Competitive advantage is identified with the set of two dimensions associated with greater benefits for the *palenquero*: future positioning and improvement of electrical installation. Future positioning is defined as the *palenquero*'s vision of entry to new markets, increase in productivity, and adoption of performance-enhancing technology, in the next two years. Partnerships are defined as the importance the *palenquero* attributes to working with other *palenqueros* or with the government. We used a 5-point Likert-type scale, asking *palenqueros* about the extent to which they will do certain things or consider important the relationships with other *palenqueros* and with the government. Answers go from 1 (nothing) to 5 (very much). The questionnaire is included in the Appendix. Factor loadings for each item are shown in Table 3 as evidence of discriminant validity of our measures.

The level of education of *palenqueros* was classified into four groups, according to the National Institute of Statistics and Geography (2010): no education (group 1), elementary education (group 2), secondary education (group 3), and higher education (group 4). Levels of education are related to specific characteristics that are linked to the improvement of business performance (Van Praag and Versloot, 2007) and the quality of life of the *palenqueros* and their families. In our research, level of education was used as an instrumental variable to solve potential problems of endogeneity in the relations proposed in our research model. Table 4 shows basic descriptive statistics for variables used in our research model, with their corresponding Pearson's bivariate correlation.

Table 3: Factor Loadings

Question	Environmental Strategy	Future Positioning	Partnerships	Communality
EA1. Water use during the baking stage	**0.8816**	0.2330	0.1585	0.857
EA2. Improvement of electrical installation	**0.8528**	0.3103	0.0068	0.824
EA3. Water use during fermentation	**0.8822**	0.2597	0.1583	0.869
PF1. Entry to new markets	0.2607	**0.9011**	0.1759	0.911
PF2. Increase in productivity	0.3059	**0.8143**	0.2097	0.801
PF3. Acquisition of technology	0.2307	**0.8341**	0.0431	0.751
A1. Partnerships with other *palenqueros*	-0.0422	0.2392	**0.8856**	0.843
A2. Partnerships with the government	0.2830	0.0456	**0.8609**	0.823
Explained Variance	2.579	1.651	2.448	
Cronbach's Alpha	0.910	0.887	0.737	

This table shows the factor loadings of the items used to measure the variables in the research model, which has been adapted to the context of the mezcal business. Loadings greater than 0.5 indicate the factor in which load each item. The reliability of the variables was determined by Cronbach's alpha and was considered appropriate with a value greater than 0.7.

Table 4: Pearson's Correlation Matrix

	Average	Standard Deviation	EA	PF	A	NE
Environmental Strategy (EA)	2.375	0.933	1.000			
Future Positioning (PF)	2.271	0.867	0.565***	1.000		
Partnerships (A)	3.219	0.702	0.273**	0.345***	1.000	
Level of Education (NE)	2.288	0.750	0.719***	0.450***	0.372***	1.000

*This table shows the bivariate Pearson correlation coefficients, with *** indicating that the correlation is significant at the 0.01 level, and coefficients with ** indicating that the correlation is significant at the 0.05 level.*

RESULTS AND DISCUSSION

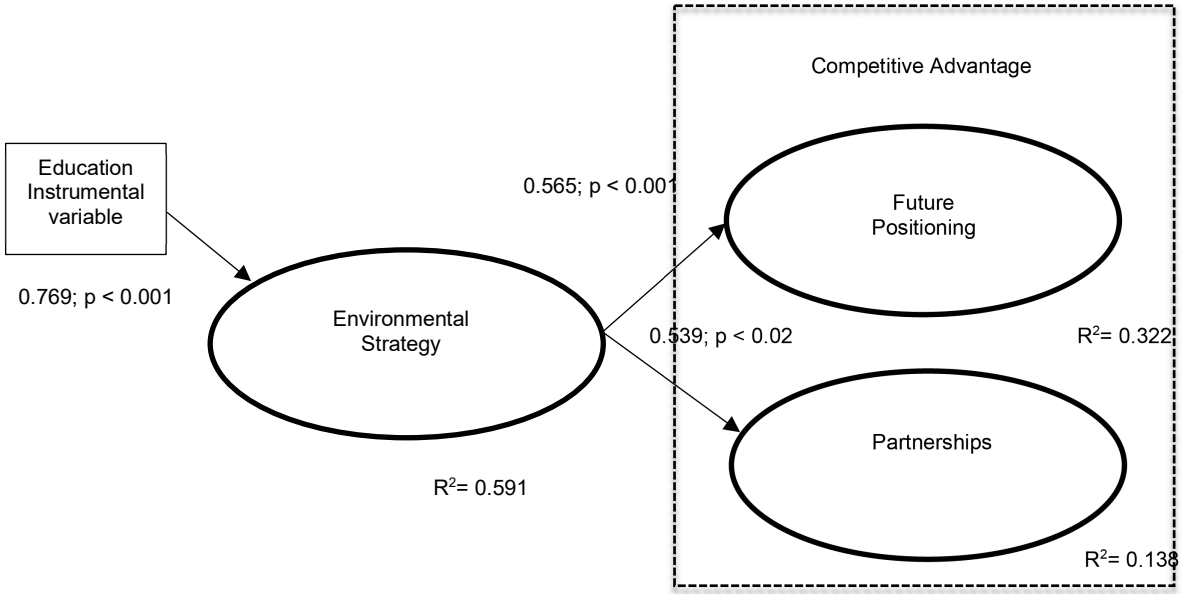
We performed a two-step structural equations model to test our hypotheses. We first tested the measurement model using observable variables (items) to measure latent variables. Then we tested the suggested effects on our hypotheses simultaneously by integrating the structural equations that corresponded to our model. In this second model, we test the effect of the environmental strategy on the variables future positioning and partnerships. Level of education is used as an instrumental variable to eradicate possible endogeneity problems. In both models we used the maximum verisimilitude method with robust adjustment as an answer to a relatively high multivariate kurtosis on the data (Standardized Mardia coefficient = 8.6). Testing was done using EQS 6.2. Our measurement model showed good fit, with a Satorra-Bentler scaled chi-squared value of 18.4; 17 degrees of freedom; *p-value* = 0.36, CFI = 0.994; and RMSEA = 0.33 with a 90% confidence interval of 0.000 – 0.109. Our structural model showed good fit as well, with a Satorra-Bentler scaled chi-squared value of 24; 23 degrees of freedom; *p-value* = 0.49, CFI = 1.000; and RMSEA = 0.000 with a 90% confidence interval of 0.000 – 0.090. Figure 2 shows the standardized regression coefficients and their statistical significance, and r-squared values for each endogenous variable. Regression equations are as follows:

*future positioning = b1*environmental strategy + disturbance of future positioning* (1)

*partnerships = b2*environmental strategy + disturbance of partnerships* (2)
*environmental strategy = b3*education + disturbance of environmental strategy* (3)

Note: Derived from the use of an instrumental variable, disturbance of future positioning and disturbance of environmental strategy, as well as disturbance of partnerships and disturbance of environmental strategy are allowed to correlate in order to obtain consistent estimates, according to Antonakis et al. (2010).

Figure 2: Research Model with Standardized Regression Coefficients



This figure shows the graphical representation of the theoretical research model with standardized regression coefficients and their significance (two tails). R^2 is reported for each independent variable in the model. The use of education as an instrumental variable allows us to obtain consistent estimates in case of potential endogeneity derived from different sources, such as common-method bias or non-measured variables. Source, own elaboration.

Table 5: Non-Standardized Regression Coefficients for Structural Model

Independent Variable	Dependent Variable	Non Standardized Coefficient	t	R^2
Level of Education (Instrumental Variable)	Environmental Strategy	0.893***	8.346	0.591
Environmental Strategy	Future Positioning	0.663***	4.342	0.322
	Partnerships	0.344**	2.522	0.138

*This table shows the non-standardized regression coefficients for the structural paths on the research model, as well as the corresponding t value and the R2 for all the dependent variables. Coefficients with *** are significant at the 0.01 level, and coefficients with ** are significant at the 0.05 level. Being all coefficients significant, the model is not rejected. The use of education as an instrumental variable allows us to obtain consistent estimates in case of potential endogeneity.*

Environmental strategy has a positive and significant impact on competitive advantages corresponding to future positioning and partnerships. Our hypotheses are supported, suggesting that environmental strategy can effectively lead to competitive advantages for mezcal producers in Oaxaca. Our results coincide with those found by Delmas, Hoffmann and Kuss (2011), and Atkin, Gilinsky and Newton (2012). These authors have studied the effect of the implementation of environmental strategies on competitive advantages, finding that environmental strategy leads to competitive advantages inside the firm.

CONCLUDING COMMENTS

The main objective of this paper is to analyze the relationship between environmental strategy and competitive advantages in mezcal businesses in Oaxaca, Mexico, using Hart's NRBV. Mezcal businesses have not been widely studied in environmental topics. We did a transverse-cut quantitative analysis on a sample of 80 small mezcal businesses; the data were obtained through a structured questionnaire. This study is exploratory due to the scarcity of empirical studies that analyze environmental issues in subsistence businesses. We used structural equations modeling for hypotheses testing and found that environmental strategies implemented (either voluntary or involuntarily) by the *palenqueros* and oriented towards product management and sustainable development (clean technology and base of the pyramid) allow mezcal businesses to gain competitive advantages in terms of future positioning and partnerships. Our findings contribute to the study of sustainable development capability that subdivides itself into clean technology and base of the pyramid. Few works have explained this capability, and even fewer have explained it in the context of subsistence, as in the case of the mezcal sector. Evidence shows that environment-oriented technology allows mezcal businesses to position themselves in the future and to offer growth opportunities to *palenqueros* that are at the base of the pyramid. With these arguments the NRBV is supported, because the findings show that strategic capabilities lead to competitive advantage, specifically, product management and sustainable development environmental strategies.

Our research makes a proposal for the measurement of environmental strategy based on a traditional mezcal-producer context. We identified that the *palenqueros* take involuntary or voluntary actions that benefit the natural environment. This finding is of significant importance; mezcal businesses have been poorly studied from an environmental perspective, and they develop in a context of poverty and environmental degradation. Our findings also show that even when it comes to small businesses with serious limitations, they are becoming aware of the importance of protecting the natural environment. Finally, we must point out some limitations and future lines of research. First, because the studied strategic capacities were product management and sustainable development from the NRVB, future investigations could add other strategic capacities, such as the prevention of contamination, something that is complicated in mezcal businesses. We also recommend covering other aspects linked to the environmental strategies of mezcal producers, such as the use of copper stills –highly toxic equipment- in the production of mezcal. Second, it would be interesting to study environmental strategies in other states with a larger sample, since the results may vary accordingly to the environmental awareness generated in each context. Third, the use of one sole data collection instrument in the measurement of perception of mezcal businesses owners or managers is a limitation in our study; however, the introduction of level of education as an instrumental variable accounts for the potential bias derived from this fact. Fourth, further research could also investigate the variables or factors that determine environmental strategy in mezcal businesses. Finally, similar investigations can be performed in other sectors composed of small businesses in emerging economies in order to confirm the importance of environmental strategies in the achievement of competitive advantages.

APPENDIX. QUESTIONNAIRE

Considering a scale from 1 to 5, where 1 is nothing, 2 is little, 3 is regular, 4 is much, and 5 is very much, describe your opinion on each of the following aspects of the business:

Variable	Reactivo	Content
Environmental Strategy	EA1	During the last year, how have improvements been made in the use of water to clean workspaces and tools used during the baking stage?
	EA2	During the last year, how have improvements been made in electrical installations used during the grinding stage?
	EA3	During the last year, how has water use during the fermentation stage been reduced?
Future Positioning	PF1	To what extent will you be entering a new market in the next two years?
	PF2	To what extent will you be increasing your productivity in the next two years?
	PF3	To what extent will you be buying technology to increase performance in the next two years?
Partnerships	A1	Do you consider partnerships with other *palenqueros* to be important for the improvement of the business?
	A2	Do you consider partnerships with the government to be important for the improvement of the business?

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BIOGRAPHY

Ileana García-Román, PhD student at National Polytechnic Institute- CIIDIR, Oaxaca, Mexico. Her research interests include the environment, as well as the competitive behavior of small and medium-sized enterprises (SMEs) in subsistence markets.

Patricia S. Sánchez Medina, PhD, is professor in the Management Department at National Polytechnic Institute –CIIDIR Oaxaca, Mexico. Her research interests are environmental management in subsistence business and fragmented industries. Within this research area she has development and participated in several research projects. Her recent research is in the field of sustainability in family businesses.

René Díaz-Pichardo, Doctor in Philosophy in Management. Professor and researcher at South Champagne Business School, France, and associate researcher at Université de Technologie de Troyes, ICD-HETIC-CREIDD, UMR 6281, CNRS, Troyes, France. His research interests are environmental management and social issues in subsistence businesses and fragmented industries.

Magdaleno Caballero Caballero, has specialized in the innovation and development of technologies suitable for crafts processes and products such as pottery and mezcal production. His research includes the integral management of Agave angustifolia Haw for industrial purposes in the state of Oaxaca, Mexico.

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A SPREADSHEET APPROACH FOR INCORPORATING ACTUAL MOTOR CARRIER FREIGHT RATES AND EXTERNAL ENVIRONMENTAL COSTS IN A NEWSVENDOR MODEL

Andrew Manikas, University of Louisville
Michael Godfrey, University of Wisconsin Oshkosh

ABSTRACT

The purpose of this paper is to present a model for maximizing a retailer's total expected profit using actual motor carrier freight rates and estimates of environmental costs associated with the transportation of a seasonal product. It is assumed that a single seasonal product is sold at a fixed price and demand for that product is normally distributed. Prior to the selling season, the retailer must determine how many units of the seasonal product to purchase from the supplier—therefore, the newsvendor model is appropriate for analyzing this problem. It is assumed that the retailer arranges and pays for transportation, i.e., the product is shipped free on board (FOB) Origin, Freight Collect from the supplier. Items unsold at the end of the season can be sold at a reduced price (salvaged). Actual freight rates are incorporated in the model by considering less-than-truckload discounts, fuel surcharges for both less-than-truckload (LTL) and truckload (TL) shipments, and over-declaring of shipments. All-units purchase quantity discounts are assumed also. Due to the nonlinear nature of motor carrier freight rates, this problem does not have a closed-form solution. Therefore, we present an Excel-based model for solving this problem. As demonstrated in the model solution, when environmental costs are considered, the buyer's optimal purchase quantity decreases.

JEL: C61, D21, L11, L81

KEYWORDS: Newsvendor Model, Environmental Costs, Motor Career Freight Rates

INTRODUCTION

The purpose of this research is to present a newsvendor model that incorporates actual motor carrier freight rates and estimates of environmental costs. We demonstrate an Excel-based model for the single-period newsvendor problem of determining the profit-maximizing purchase quantity for a seasonal or perishable item. A newsvendor model balances the marginal cost of ordering (stocking) one unit too many with the marginal benefit of stocking (ordering) one unit too few to find the optimal quantity to stock to maximize the expected profit. The model presented in our study builds in actual less-than-truckload (LTL) and truckload (TL) freight rates and considers motor carrier industry practices of freight rate discounts, fuel surcharges, and over-declaring of shipments. Less-than-truckload carriers typically provide customers with software listing the base linehaul (point-to-point) rates to move various shipment weights between zip codes. Customers negotiate discounts from those base linehaul rates to determine their actual LTL freight rates for various weight-break ranges. In addition, current motor carrier practice for both LTL and TL carriers is to include a fuel surcharge to account for rising diesel fuel prices. Over-declaring of shipments, discussed in detail later in the paper, is designed into LTL carrier's software to determine if a customer's shipment should be artificially inflated to the next weight-break range to reduce the customer's total freight charge, e.g., if 499 pounds should be over-declared as 500 pounds.

In addition, we illustrate how to estimate external emission costs based on previous literature and how to incorporate those costs into the newsvendor model. External costs are costs created by a company, such as environmental damage, which are borne by society or the planet. Sustainability has been an important issue since the publication of the Brundtland Report, or *Our Common Future* (World Commission on Economic Development, 1987, p. 8), in which sustainable development was described as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Later, other authors, e.g., Elkington (1994, 1998), expanded the definition of sustainability to include the triple bottom line of economic, environmental, and social performance. A purchasing decision maker has two options when attempting to build in external environmental costs into this type of purchasing model. The first option is to use company-specific estimates of environmental costs. The second option is to use an estimate from the previous literature and adjust that estimate for inflation and currency exchange rates. Given that we did not have access to company-specific estimates of environmental costs, we chose the latter approach. Our model, however, could accommodate either approach. Using an Excel spreadsheet, we compare the purchase quantity both with and without external costs. In addition, we enumerate all possible purchase order quantities because a closed-form solution for solving this model does not exist due to the nonlinear nature of the motor carrier freight rates. The next section discusses the literature review. After that, we present the model formulation, followed by the model description. The last two sections include results followed by discussion and conclusions.

LITERATURE REVIEW

As stated by Darwish (2008, p. 3902), "… the increased emphasis on transportation costs has enhanced the need to develop models with transportation consideration explicitly." We argue that these models also should reflect industry practices such as over-declaring of shipments, fuel surcharges, and the use of multiple modes of transportation. In addition, research in the supply chain field recently has begun to emphasize environmental and social effects of transportation (Ortolani, Persona, & Sgarbossa, 2011) and inventory management decisions (Battini, Persona, & Sgarbossa, 2014). Given the aforementioned concerns, the first section of the literature review focuses on inventory models extending the basic economic order quantity (EOQ) model to include transportation and/or environmental costs. The second section provides a review of newsvendor models that consider transportation and/or environmental costs.

EOQ-Type Inventory Models

The first type of purchasing model incorporating transportation costs was the inventory-theoretic model (Baumol & Vinod, 1970). The inventory-theoretic model added estimates of transportation costs into the economic order quantity (EOQ) model with deterministic demand. Follow-up studies demonstrated how to include actual motor carrier freight rates in the deterministic inventory-theoretic model (e.g., Carter & Ferrin, 1996; Gaither, 1982; Langley, 1980; Larson, 1988; Tyworth, 1991b; Wehrman, 1984). Those studies, similar to the current study, used enumeration techniques to solve for the minimum cost purchase quantity, i.e., the quantity that minimized the sum of the annual purchasing, ordering, carrying, and transportation costs. Follow-up studies employed algorithms for solving the inventory-theoretic model with actual motor carrier freight rates (e.g., Burwell, Dave, Fitzpatrick, & Roy, 1997; Hwan, Moon, & Shin, 1990; Lee, 1986; Madadi, Kurz, & Ashayeri, 2010; Ramasesh, 1993; Russell & Krajewski, 1991; Tersine & Barman, 1991; Tersine, Larson, & Barman, 1989). Further extensions included a study by Mendoza and Ventura (2008), who considered two modes of transportation (truckload and less-than-truckload) and two types of purchase quantity discounts (all-units and incremental). He, Hu, and Guo (2010) presented an algorithm for solving the deterministic inventory-theoretic model with actual freight rates; however, they ignored purchase quantity discounts for larger purchase quantities. Darwish (2008) developed procedures to solve an inventory-theoretic model with stochastic demand, all-units/incremental purchase quantity discounts, and all-weight/incremental freight discounts, but ignored current motor carrier practice of automatically over-declaring shipments.

The difficulty in solving the inventory-theoretic model arises due to the nature of the LTL linehaul freight rates, which resemble a nonlinear step function. In addition, LTL carrier software automatically considers whether to over-declare a customer's shipment weight. Russell and Krajewski (1991) were among the first to analyze this practice of over-declaring shipment weights. Over-declaring a shipment occurs when a shipment weight is inflated artificially to the next rate breakpoint (the next highest weight-break range) to decrease the total freight charge of the shipment, e.g., 990 pounds over-declared as 1,000 pounds. For each weight-break range (except the last one) in the LTL base freight rate schedule for a product, we could calculate an indifference point beyond which we would over-declare the shipment weight to the next LTL weight-break range. In addition, we need to determine the shipment weight for the last LTL weight-break range at which we would over-declare as a truckload and use the TL carrier to reduce the total freight charge. In fact, as demonstrated later in this paper, we may determine that shipment weights much less than the last LTL weight-break range might be transported using the TL carrier to reduce the customer's total freight charge. An alternate approach to using actual freight rates in the inventory-theoretic model is to estimate freight rates using a continuous freight rate function.

Examples of freight rate functions include an inverse function assuming that all shipments are charged the TL freight rate (Blumenfeld, Burns, Daganzo, Frick, & Hall, 1987; Sheffi, Eskandari, & Koutsopoulos, 1988; Swenseth & Godfrey, 2002; Yildirmaz, Karabati, & Sayin, 2009), a proportional (linear) function based on transport distance (Ballou, 1991), an exponential function (Buffa, 1987, 1988), an adjusted inverse function (Swenseth & Buffa, 1990, 1991; Swenseth & Godfrey, 1996, 2002), and a nonlinear function using load density, shipment weight, and shipment distance (Kay & Warsing, 2009). Some researchers, e.g. Ballou (1991), argued for using freight rate functions, rather than actual freight rates, to reduce time and effort when creating inventory-theoretic models. Mendoza and Ventura (2009) pointed out correctly that using actual freight rates in the inventory-theoretic model leads to a model for which no closed-form solution exists. However, Higginson (1993) and Tyworth (1991a) criticized existing freight rate functions for not estimating freight rates accurately.

Accounting for environmental costs is more difficult than accounting for transportation costs. One approach used in the research has been to estimate environmental costs. For example, Hovelaque and Bironneau (2015) developed a carbon-constrained EOQ model using a range of estimates for the carbon tax per unit. Their model, however, ignored transportation cost. Conversely, Bozorgi, Pazour, and Nazzal (2014) included transportation cost based on using full truckload shipments to find the minimum cost quantity, and then compared that quantity to the quantity found when trying to minimize overall emissions. Battini et al. (2014) developed a sustainable EOQ model to analyze economic and environmental trade-offs of lot sizing in material purchasing. In their model, they estimated transportation-related environmental (emissions) costs based on an earlier study by Ortolani et al. (2011), and estimated transportation costs using a simplified transport cost function consisting of a fixed and a variable portion. Although their model allowed for the possibility of a large shipment requiring more than one container, it is unclear whether they based vehicle capacity (saturation) on weight or cube.

Newsvendor Models

The newsvendor model, similar to the EOQ model, is one of the classical problems in inventory management. As is the case when using the EOQ model for purchasing continuously reviewed inventory items, a buyer must account for transportation and environmental costs when purchasing seasonal items for a single period (selling season). The studies reviewed below all assumed stochastic demand over the season. Abad (2006) created an optimal single period profit-maximizing model for determining the retailer's optimal order quantity under the following assumptions: no purchase quantity discounts and unit cost is given, trailer capacity is limited by weight (46,000 pounds), a combination of truckload and less-than-truckload shipments is possible, and actual motor carrier freight rates and over-declaring of shipments are considered. Limitations of their model included the assumption of truckload capacity determined by weight

only (they ignored the possibility of a shipment cubing out a trailer) and omission of fuel surcharges and environmental costs. In a more recent study, Konur and Toptal (2012) analyzed the newsvendor problem for a single item lot-sizing and supplier selection profit-maximization problem with the following assumptions: unit cost from the supplier defined by an all-units quantity discount schedule, and the use of truckload carriers only. Their study was limited in that they ignored less-than-truckload shipments and freight rates, over-declaring of shipments, fuel surcharges, and environmental costs. Hua, Wang, and Cheng (2012) extended the newsvendor model to incorporate both purchase quantity discounts and freight rates (including over-declaring) to determine a retailer's optimal purchase quantity and selling price simultaneously. They used a generalized transport cost function with a fixed and a variable component, but ignored fuel surcharges. In addition, their model did not include environmental costs.

The integration of environmental costs into newsvendor models has occurred only recently. Bushuev, Guiffrida, Jaber, and Khan (2015) argued that research in this area has been scattered, and that the most used sustainability criterion has been units of carbon equivalent emissions (usually carbon dioxide). As an example, Arikan and Jammernegg (2014) created a newsvendor model under dual sourcing with a carbon footprint constraint. They proposed that an upper bound for carbon emissions could be derived either from a company's environmental target or from an industry standard. A few studies (e.g., Manikas & Godfrey, 2010; Zhang & Xu, 2013; Rosic & Jammernegg, 2013) estimated the per-unit cost of emissions based on the cost to purchase the right to emit carbon in a cap and trade market or an emissions tax per unit. Each of these previous research streams failed to integrate realistic motor carrier freight practices, purchase quantity discounts, and environmental costs into a single model for determining the profit-maximizing purchase order quantity for a seasonal item. Therefore, the model presented in the next section is designed to overcome these limitations in the context of an Excel-based spreadsheet.

Model and Notation

A newsvendor model calculates the optimal expected profit for a demand distribution where the mean, the standard deviation and the shape (normal, uniform, exponential, etc.) of the curve are known. The newsvendor typically is a single period model, which means that the items in stock cannot be sold for full price beyond the selling season (i.e., demand perishes). Items left over need to be either sold at a discount or disposed of at additional cost. Given that a seasonal product is considered in this paper, the use of the newsvendor model is appropriate. The profit maximizing quantity associated with the probability point on this demand curve depends on the cost parameters for a particular problem. At its most basic, the newsvendor balances marginal benefit with marginal cost to determine the point on the demand curve at which the cost of overstocking an additional unit equals the cost of understocking by one unit. The cost of overstocking by one unit is denoted by C_o. Any item left over will have incurred its cost (purchase cost, transportation cost, and external cost). The retailer might be able to sell the item at a reduced selling price after the selling season. This selling price is assumed to be less than the retailer's purchase cost, and is known as the salvage value. Further, it may be that instead of earning the salvage value, the retailer might have to pay an additional disposal fee instead. In addition, to ensure accurate accounting, we assume that any unsold units have been in our possession for the entire selling season, and thus incur a holding cost over that season. The cost of being short one unit is denoted by C_u. At a minimum, the retailer loses the profit that it would have made on that additional unit. The retailer also may experience goodwill issues that could affect its company image, but loss of goodwill costs is difficult to quantify and is omitted from the model that we present here. The complete list of variables and an explanation of those variables follow.

Variables

p = price per unit (retail selling price)
c = purchase cost per unit
s = salvage value per unit

C_h = holding cost for the entire selling season per unit unsold
C_s = inbound shipping cost per unit
C_e = external cost per unit
μ = mean demand
σ = standard deviation of demand
$f(x)$ = the normal density function
$f_s(\ )$ = the standard normal density function
F = the normal cumulative distribution function
$F_s(\ )$ = the standard normal cumulative distribution function
C_o = cost of overstocking by one unit
C_u = cost of understocking by one unit

Explanation of variables: p is the selling price at which the retailer sells the item to its customers, and c is the retailer's purchase cost per unit. In a simple scenario, the profit per item would equal $p - c$. This profit would equal the penalty for being one unit short of the realized demand, i.e., C_u would equal the cost of underage. However, for the model we present here, there are additional costs. We use C_s as the shipping (transportation) cost per unit to transport the item from the supplier's facility to the retailer's facility. To capture externalities, we quantify any environmental impacts as C_e. We estimated external costs using the approach of Ortolani et al. (2008). They analyzed the previous literature to derive estimates of road transport external costs imposed on society. They expressed all cost categories in terms of 2008 Euros, specifically, as €/ton-km, assuming an average load of 14.3 tons. They defined thirteen cost categories of external costs for road transport and calculated average costs for each category. Their thirteen categories included the following: emissions – air pollution (damage to human health from carbon monoxide, nitrogen oxides, and volatile organic compounds); emissions – greenhouse effect (climate change due to carbon dioxide emissions); congestion (economic damage of the loss of time of time suffered); noise (annoyance, decline in productivity, and adverse health effects); accidents; road damage; resource consumption; roadway land cost; land use impact; water pollution; waste disposal; traffic services; and barrier effect (cost related to delays and discomfort imposed on society). In their work, the average cost of total road transport external costs was 0.0949 €/ton-km. Next, applying the 2008 exchange rate (Yearly Average Exchange Rates – US Forex Foreign Exchange) to convert to US dollars (1 € = $1.1226), and converting kilometers to miles, resulted in 0.0949 €/ton-km * 1.1226 * 0.62 miles/km = $0.066052/ton-mile. Finally, adjusting for inflation from 2008 to 2016 (US Inflation Factor) provided $0.066052/ton-mile * (1 + 0.119) = $0.073912/ton-mile as the 2016 estimate of C_e. Given that the example in Table 1 uses a distance of 1,748 miles, we can determine the Total External Cost for a given shipment weight (in pounds) as follows:

$$Total\ C_e = \$0.073912 * \text{Shipment Weight}/2{,}000 * 1{,}748 \quad (1)$$

The following example illustrates how to apply Equation (1):
Total external cost for transporting 400 pounds = $0.073912 * 400/2,000 * 1,748 = $25.84.
Total external cost for transporting 45,000 pounds = $0.073912 * 45,000/2,000 * 1,748 = $2,906.95.
After accounting for external costs, the cost of underage per unit is:

$$C_u = p - c - C_s - C_e \quad (2)$$

Conversely, if the retailer were to have a unit left over at the end of the selling season, the retailer would have incurred costs but not sold the unit for a profit, so there would be a cost of being over (C_o). Further, because the item remained unsold on the shelf for the entire selling season, the retailer would incur the one season holding cost (C_h). Finally, any salvage value (s) then would be subtracted from the overage cost. Salvage value (s) is a scrap value that the leftover item can be sold for (discounted price) Note: Instead of a salvage value, the retailer could incur a disposal fee to take the unit away; thus, salvage value could be a negative number. Therefore, the retailer's cost of overage per unit is:

$$C_o = c + C_h + C_s + C_e - s \tag{3}$$

We have outlined the cost of underage per unit and the cost of overage per unit. Next, we discuss the formulas that will allow us to find the quantity corresponding to the expected maximum profit. We start with our formulas for the cost of underage (2) and the cost of overage (3) for a given order quantity (q). If q units are ordered and realized demand (x) is $x \leq q$, each unit sold (x) increases profits by $p - c - C_s - C_e$, and each unsold unit ($q - x$) results in a loss of $c + C_h + C_s + C_e - s$. If demand is larger than q, q units are sold for a profit of $p - c - C_s - C_e$ each, and the remaining demand of $x - q$ goes unmet. As mentioned before, it may be that we want to include a loss of goodwill penalty in the cost of underage as well, but given that brand image and customer loyalty are difficult to quantify, we omitted a goodwill term here. We can express expected profit as:

$$\text{Expected Profit} = \int_{x=-\infty}^{q}[(p - c - C_s - C_e)x - (c + C_h + C_s + C_e - s)(q - x)]f(x)dx + \int_{x=q}^{\infty}(p - c - C_s - C_e)f(x)dx \tag{4}$$

The first term in (4) is the probability that demand is between negative infinity (0 units) and a quantity q. The x term means that the retailer would receive the profit (cost of underage) for each x units sold up to quantity q on hand. The next term in (4) represents the (q - x) scenario, where the retailer has more q on hand than actual demand x. The retailer incurs the overage cost for each of these (q - x) units. Notice that the retailer may recoup some of its costs via the subtraction of the salvage (s) term. Conversely, if the retailer has a disposal cost (s is negative), the retailer would incur additional costs beyond product cost, holding cost, shipping cost, and external cost. The final term in (4) represents the probability that realized demand is larger than q. The retailer would earn a profit (cost of underage) for selling q units demanded even if they had stocked more than q units (the remainder would be unsold and incur a cost of overage). If the retailer was confident in quantifying the loss of goodwill for not filling demand out of stock, a positive cost penalty term could be added into this third term. We know the following (Chopra & Meindl, 2013, p. 393):

$$\int_{x=-\infty}^{q} xf(x)dx = \mu F_s\left(\frac{q-\mu}{\sigma}\right) - \sigma f_s\left(\frac{q-\mu}{\sigma}\right) \tag{5}$$

By substitution, expected profits can be expressed using the following equations:

$$\text{Expected overstock units} = (q - \mu)F_s\left(\frac{q-\mu}{\sigma}\right) + \sigma f_s\left(\frac{q-\mu}{\sigma}\right) \tag{6}$$

$$\text{Expected understock units} = (\mu - q)\left[1 - F_s\left(\frac{q-\mu}{\sigma}\right)\right] + \sigma F_s\left(\frac{q-\mu}{\sigma}\right) \tag{7}$$

Knowing the costs of overstocked and understocked units allows us to write the expected profit as:

$$E[\pi] = (p + C_h - s)\mu F_s\left(\frac{q-\mu}{\sigma}\right) - (p + C_h - s)\sigma f_s\left(\frac{q-\mu}{\sigma}\right) - q(c + C_h + C_s + C_e - s)F(q,\mu,\sigma) + q(p - c - C_s - C_e)[1 - F(q,\mu,\sigma)] \tag{8}$$

The mean μ and standard deviation σ describe the expected demand curve. This expected profit function is concave (the second derivative is negative). To find the maximum of this concave function, we take the first derivative and set it to 0, thus finding the quantity q at the peak (zero slope). This is the point at which the marginal cost of overage equals the marginal cost of underage. Because shipments in each less-than-truckload (LTL) weight break range would be over-declared to the next LTL weight break range or to a TL charge, the function in (8) is not smooth, however. The actual freight range function would consist of alternating ranges for which a constant charge for shipment applies followed by a weight break range for

which a constant charge per hundred pounds (CWT) applies. Given the non-smooth nature of the freight rates, a closed-form solution for this problem does not exist, hence the use of a spreadsheet. Each term is "marginal" because the C_o term is multiplied by the probability that the unit would not sell, and the C_u term is multiplied by the probability that the unit would sell. The quantity at which these two marginal costs are equal is, by definition, the optimal quantity, according the expected profit equation. For our model, the freight rates introduce jumps (local maxima) in the profit equation, but we still are interested in the global maximum expected profit that is found by our model.

Model Description

A detailed description of the Excel model is provided below. The spreadsheet is designed to apply realistic transportation practices (i.e., actual LTL and TL freight rates, including minimum LTL and TL charges; LTL and TL fuel surcharges; LTL discounts negotiated with the LTL carrier; and over-declaring of shipments). The model allows for the possibility that a purchase order quantity may result in a shipment quantity that exceeds the truckload capacity (based on weight or cube). Such a scenario would require a combination of one TL shipment plus one additional LTL shipment or TL shipment. For simplicity, we assumed that any shipments requiring more than two truckloads would be transported via rail instead; therefore, our model does not consider shipments larger than two truckloads (although the model easily could be modified for such large shipments). Our model allows for the inclusion of environmental costs—here we considered only an estimate of external cost based on the previous literature. However, in practice, a buyer using this model could use company-specific estimates of environmental costs. In addition, the model is designed to determine the profit-maximizing quantity, both when environmental costs are considered and when environmental costs are ignored.

Table 1 contains cells for both input data and output data. Explanations of the input and output data are provided below the table. The retailer's selling price per unit is entered in Cell B5. The retailer's season holding cost % is entered in Cell B6 and was calculated by taking the annual holding cost %/12 to convert the holding cost % to correspond to a 1-month season. The mean forecast demand and the standard deviation of demand for the selling season are entered in Cells B7:B8. Cells C6:D9 can be used to enter the all-units quantity discount schedule provided by the supplier. This range from C6:D9 (Range Name = "UNITCOST") allows for a maximum of four quantity ranges. As illustrated in this example, there are three quantity ranges corresponding to 1 – 299 units, 300 – 599 units, and 600+ units.

Rows 11 through 25 contain cells for entering transportation and environmental data (external cost). Unit weight and cubic feet must be entered in Cells B12:B13. The example nominal (base) LTL freight rate schedule is entered in Cells C13:D20. Note: The retailer, of course, would be able to look up current freight rates in software provided by its carrier. First, the Minimum LTL Charge is entered in Cell D13. The LTL rates per century weight (CWT) are entered in Cell D14 for 1 – 499.99 pounds, Cell D15 for 500 – 999.99 pounds, Cell D16 for 1,000 – 1,999.99 pounds, Cell D17 for 2,000 – 4,999.99 pounds, Cell D18 for 5,000 – 9,999.99 pounds, Cell D19 for 10,000 – 19,999.99 pounds, and Cell D20 for 20,000 pounds or more. The LTL discount, the LTL fuel surcharge, and over-declaring are considered in another part of the spreadsheet (Table 2) when determining the freight charge for a shipment. Cell B22 is where the TL Fuel Surcharge/Mile is entered, and the TL Rate/Mile is entered into Cell D22. The Maximum TL Weight capacity and the Maximum TL Cube capacity are entered into Cells B23:B24. Note: Capacity limits for a company's unique scenario may differ due to the type of product being transported, trailer length and weight, etc. Cell D23 is used to enter the distance (Miles) for the given route. The minimum truckload charge (Min TL Charge) is entered in Cell D24. The External Cost (expressed as $/ton-mile) is entered in Cell B25. The output data in Table 1 include the Optimal Quantity (profit-maximizing quantity) and the Expected Profit for two situations: (1) Cells B29:B30 show the optimal quantity and the expected profit when external costs are considered, and (2) Cells B33:B34 show the optimal quantity and the expected profit when external costs are ignored. The formulas for these cells are listed below and reference Table 4.

Table 1: Input Data & Output Data

	A	B	C	D	E
4	Inputs:		Unit Cost Schedule (*c*)		
5	Price per Unit (*p*)	$80.00	At Least	Unit Cost	
6	Season Holding Cost %	2%	1	$50.00	
7	Mean Demand (μ)	600	300	$48.00	
8	Standard Deviation of Demand (σ)	120	600	$46.00	
9					
10					
11			**Nominal LTL Freight Rate Schedule**		
12	Unit Weight (pounds)	40	Range	Rate	
13	Unit Cubic Feet	4.50	Minimum	$544.11	
14			1	$363.37	/CWT
15	LTL Discount (%)	55.00%	500	$278.43	/CWT
16	LTL Fuel Surcharge (%)	20.20%	1000	$236.69	/CWT
17			2000	$200.71	/CWT
18			5000	$175.09	/CWT
19			10000	$144.12	/CWT
20			20000	$135.48	/CWT
21					
22	**TL Fuel Surcharge/Mile ($)**	$0.64	**TL Rate/Mile ($)**	$1.35	
23	Maximum TL Weight	46,100	Miles	1748	
24	Maximum TL Cube	4,108	TL Min. Charge	$600.00	
25	External Cost ($/ton-mile)	$0.073912			
26					
27		**Output Data**			
28	**Profit-Maximizing Quantity (including External Costs)**				
29	Optimal Quantity	531			
30	Expected Profit	$2,215.15			
31					
32	**Profit-Maximizing Quantity (excluding External Costs)**				
33	Optimal Quantity	542			
34	Expected Profit	$3,601.41			

The top part of this table shows input data for the seasonal product including price per unit, mean and standard deviation of seasonal demand for the product, purchase cost per unit, and transportation data (LTL and TL costs per hundred pounds (CWT), shipping weight and cube). The bottom part of this table shows output data (optimal quantity and expected profit, with and without external emissions cost).

Cell B29: =INDEX(M10:M969,MATCH(B30,AB10:AB969,0))
Cell B30: =MAX(AB10:AB969)
Cell B33: =INDEX(M10:M969,MATCH(B34,AD10:AD969,0))
Cell B34: =MAX(AD10:AD969)

Table 2 displays the LTL and the TL freight rates after applying the negotiated LTL Discount and the LTL Fuel Surcharge % to nominal LTL rates, and the TL Rate/Mile, the TL Fuel Surcharge/Mile, Miles, and the Min. TL Charge to determine the relevant TL charge. First, the LTL Minimum charge (Range Name = "LTLMINCHARGE") is calculated in Cell I5 by taking the nominal charge in Cell D13 of Table 1, applying the LTL discount from Table 1 to that nominal charge, and then adding in the LTL fuel surcharge from Table 1 as shown in the following formula:
=D13*(1-B15)*(1+B16)

The actual freight rates and over-declared charges are calculated in Cells G6:J12 (Range Name = "ACTUALRATES") in Table 2. Cells H6:H12 are the actual freight rates per CWT for each of the LTL weight ranges after applying the LTL discount and the LTL fuel surcharge. The formulas for these cells are listed below:

Cell H6: =D14*(1-$B$15)*(1+$B$16)
Cell H7: =D15*(1-$B$15)*(1+$B$16)
Cell H8: =D16*(1-$B$15)*(1+$B$16)
Cell H9: =D17*(1-$B$15)*(1+$B$16)
Cell H10: =D18*(1-$B$15)*(1+$B$16)
Cell H11: =D19*(1-$B$15)*(1+$B$16)
Cell H12: =D20*(1-$B$15)*(1+$B$16)

Table 2: Actual Freight Rate Schedule

	G	H	I	J	K
4	**Weight (lbs.)**	**Rate/CWT**	**Charge**	**Charge**	
5	**LTLMIN**		$294.31		
6	1	$196.55		$753.01	
7	500	$150.60		$1,280.26	
8	1,000	$128.03		$2,171.28	
9	2,000	$108.56		$4,735.31	
10	5,000	$94.71		$7,795.45	
11	10,000	$77.95		$14,656.23	
12	20,000	$73.28		**$3,478.52**	**TL CHARGE**

*This table shows the determination of the actual less-than-truckload (LTL) and truckload (TL) charges along with the over-declared charge for each LTL weight break range. For example, for shipment weights between 1- 499.99 pounds, a minimum LTL charge ($294.31) would apply up to a given weight within that range (up to the weight at which the Weight (CWT) * Rate/CWT is greater than the minimum LTL Charge). The Rate/CWT ($195.65) would apply until over-declaring the shipment as 500 pounds at a rate of $150.50/CWT ($753.01) would reduce the total transportation charge for the shipment.*

Next, over-declared charges for each LTL weight range are determined. We ignored the extremely rare situation that Ferrin and Carter (1995) described as anomalous weight breaks in LTL pricing. An example of an anomalous weight break in LTL pricing would occur when a given LTL weight would be over-declared beyond the next immediate weight range, e.g., if 1,500 pounds were over-declared as 5,000 pounds, rather than as 2,000 pounds, because the total freight charge for 5,000 pounds was less than that for 2,000 pounds. We ignored anomalous weight breaks because LTL carriers ought to be able to prevent such situations given that their freight rates now are stored electronically within in a database. In the highly unlikely event that an anomalous weight break occurred, such a scenario would be easy to discern in Table 2, and the formulas could be adjusted accordingly. In addition, to simplify the calculation of LTL freight rates, we ignored special charges such as a single shipment charge for shipment weights between 1 – 499.99 pounds (although our model could be modified to handle this situation also).

Cell J6 corresponds to the freight charge for shipments of 1 – 499.99 pounds over-declared as 500 pounds. Cell J7 corresponds to the freight charge for shipments of 500 – 999.99 pounds over-declared as 1,000 pounds. Cell J8 corresponds to the freight charge for shipments of 1,000 – 1,999.99 pounds over-declared as 2,000 pounds. Cell J8 corresponds to the freight charge for shipments of 1,000 – 1,999.99 pounds over-declared as 2,000 pounds. Cell J9 corresponds to the freight charge for shipments of 2,000 – 4,999.99 pounds over-declared as 5,000 pounds. Cell J10 corresponds to the freight charge for shipments of 5,000 – 9,999.99 pounds over-declared as 10,000 pounds. Cell J11 corresponds to the freight charge for shipments of 10,000 – 19,999.99 pounds over-declared as 20,000 pounds. Cell J12 corresponds to the freight charge for shipments of 20,000 pounds or more over-declared as a TL shipment. Note: It is possible that shipment

weights less than 20,000 pounds could be over-declared as a TL shipment if doing so would decrease the total freight charge. In the example used in this paper, the actual TL Charge shown in Cell J12 is $3,478.52 and the LTL Over-Declared Charge for 10,000 pounds (which occurs at 20,000 pounds) is $14,656.23 (Cell J11). In fact, the TL charge of $3,378.52 is less than the Over-Declared Charge for 5,000 pounds ($4,735.31) in Cell J9. Therefore, in this example, over-declaring the LTL to the TL rate is cheaper. The formulas for Cells J6:J12 are shown below. The formula in Cell J12 ensures that the calculated TL Charge would never be less than the TL Min. Charge (from Table 1), and then adds in the TL Fuel Surcharge/Mile from Table 1.

Cell J6: =G7/100*H7
Cell J7: =G8/100*H8
Cell J8: =G9/100*H9
Cell J9: =G10/100*H10
Cell J10: =G11/100*H11
Cell J11: =G12/100*H12
Cell J12: =MAX((D24+(D22+B22)),(D23*(D22+B22)))

Table 3 is used to determine the range of order quantities to consider when determining expected profit. Cell O4 is used to calculate the maximum number of units that could be loaded on a trailer based on weight (Maximum TL Weight/Unit Weight from Table 1). Next, Cell P4 is used to calculate the maximum cube that would fit on a trailer (Maximum TL Cube/Unit Cubic Feet from Table 1). Cell Q4 calculates the Maximum TL Capacity in units based on the lower of the two values in Cells O4 and P4. The TL Capacity (units) affects how total freight charge is calculated for shipments that exceed the capacity of single truckload. Next, Cell O5 calculates the Mean Demand + 3 sigma (from Table 1) to account for approximately 99.87% of the possible seasonal demand for the item. The vast majority of real data scenarios will have an optimal quantity that falls within 0 to mean + 3 standard deviations; however, Cell O5 could be altered easily to a multiplier greater than 3. Cell O5 will determine the number of rows required in the spreadsheet.

Table 3: Determination of Possible Order Quantities

	M	N	O	P	Q
3			**Weight**	**Cube**	**Capacity**
4	**TL Capacity (units) =**		1152	912	**912**
5	**Mean Demand + 3σ =**		960		

This table shows the truckload (TL) capacity in units determined based on taking the lower value of the TL Capacity Weight and TL Capacity Cube. In addition, the Mean Demand + 3σ is determined.

Table 4 is used to calculate cost values for all possible order quantities up to 960 units. Due to space limitations, only the rows for order quantities between 1 – 10 units are shown.

Table 4: Cost Calculations

	M	N	O	P	Q	R	S	T	U	V
8								Shipping	Total	External
9	Order	Unit	Holding	Shipment	Excess	Excess	Freight	Cost per	External	Cost per
10	Quantity (q)	Cost (c)	Cost per Unit (C_h)	Weight	Units	Weight	Charge	Unit (C_s)	Cost	Unit (C_e)
11	1	$50.00	$5.16	40.00	0	0.00	$294.31	$294.31	$0.43	$0.43
12	2	$50.00	$2.96	80.00	0	0.00	$294.31	$147.15	$0.85	$0.43
13	3	$50.00	$2.22	120.00	0	0.00	$294.31	$98.10	$1.28	$0.43
14	4	$50.00	$1.93	160.00	0	0.00	$314.47	$78.62	$1.71	$0.43
15	5	$50.00	$1.93	200.00	0	0.00	$393.09	$78.62	$2.13	$0.43
16	6	$50.00	$1.93	240.00	0	0.00	$471.71	$78.62	$2.56	$0.43
17	7	$50.00	$1.93	280.00	0	0.00	$550.33	$78.62	$2.99	$0.43
18	8	$50.00	$1.93	320.00	0	0.00	$628.95	$78.62	$3.41	$0.43
19	9	$50.00	$1.93	360.00	0	0.00	$707.57	$78.62	$3.84	$0.43
20	10	$50.00	$1.88	400.00	0	0.00	$753.01	$75.30	$4.27	$0.43

This table shows the calculations for order quantities between 1 – 10 units. First, the applicable unit cost and the holding cost per unit are determined. Next, the number of units (and their total weight) beyond the TL capacity are determined so that the relevant freight charge can be calculated. After that, the freight charge is converted to shipping cost per unit. Then the total external cost is determined and converted to external cost per unit.

Column M contains all of the possible order quantities. The order-up-to quantity each period [Order quantity (q)] goes from 1 unit to Mean + (3* standard deviation) units. We assumed that we would want to order at least one unit (i.e., if we were to order 0 units, profit would equal $0, thus being trivial). First, "1" is entered in Cell M11 to indicate that q = 1. Next, the formula in Cell M12 is entered as follows:

Cell M12: =IF(M11<>"",IF(M11+1<=$O$5,M11+1,""),"")

The formula in Cell M12 was copied down to Cells M13:M3010 to allow for a maximum order quantity of 3,000 units. If the order quantity were to exceed 3,000 units, we could copy the formula from Cell M12 to additional cells as needed. Given that the Mean Demand + 3σ = 960, all other formulas discussed below will need to be copied from Row 11 to Rows 12 through 970.
Column N is used to determine the applicable Unit Cost based on the all-units quantity discount schedule provided by the supplier in Cells C6:D9 of Table 1 (Range Name = "UNITCOST"). The formula in Cell N11 (shown below) needs to be copied down to Cells N12:N970.

Cell N11: =VLOOKUP(M11,UNITCOST,2)

Column O determines the Holding Cost per Unit for the selling season. Given that Total Cost per Unit = Unit Cost (c) + Shipping Cost per Unit (C_s), Holding Cost per Unit = Total Cost per Unit * Season Holding Cost %. The formula for Cell O11 (shown below) needs to be copied down to Cells O12:O970.

Cell O11: =(N11+T11)*$B$6
Column P determines the Shipment Weight. Shipment Weight = Units (q) * Unit Weight in pounds (from Table 1). The formula for Cell P11 (shown below) needs to be copied down to Cells P12:P970.

Cell P11: =$B$12*M11

Column Q determines the number of Excess Units (those q units beyond the maximum TL Capacity from Table 3). We need to know the number of excess units to be able to determine the total freight charge when

shipment size exceeds the TL capacity. The formula for Cell Q11 (shown below) needs to be copied down to Cells Q12:Q970.

Cell Q11: =MAX(0,M11-$Q$4)

Column R determines the weight corresponding to the number of Excess Units. Excess Weight = Excess Units * Unit Weight (from Table 1). The formula for Cell R11 (shown below) needs to be copied down to Cells R12:R970.

Cell R11: =$B$12*Q11

Column S uses Cells G6:J12 (Range Name = "ACTUALRATES" from Table 2) to determine the Freight Charge for each order quantity (q). The formula for Cell S11 (shown below) needs to be copied down to Cells S12:S970.

Cell S11: =IF(Q11=0,MIN(MAX(LTLMINCHARGE,VLOOKUP(P11,ACTUALRATES,2)*P11/100),VLOOKUP(P11,ACTUALRATES,4),TLCHARGE),TLCHARGE+MIN(MAX(LTLMINCHARGE,VLOOKUP(R11,ACTUALRATES,2)*R11/100),VLOOKUP(R11,ACTUALRATES,4),TLCHARGE))

Column T determines the Shipping Cost per Unit. Shipping Cost per Unit = Freight Charge/*q*. The formula for Cell T11 (shown below) needs to be copied down to Cells T12:T970.

Cell T11: =S11/M11

Column U determines the External Cost for a given order quantity (*q*) and is calculated as External Cost = External Costs ($/ton-mile) * Shipment Weight/2000 * Miles. External Cost and Miles are obtained from Table 1. The formula for Cell U11 (shown below) needs to be copied down to Cells U12:U970. External cost dollarizes the external impacts of environmental damage.

Cell U11: =$B$25*P11/2000*$D$23

Column V determines the External Cost per Unit (External Cost/*q*). The formula for Cell V11 (shown below) needs to be copied down to Cells V12:V970.

Cell V11: =U11/M11

Table 5 is used to calculate expected profit values for all possible order quantities up to 960 units. Due to space limitations, only the rows for order quantities between 1 – 10 units are shown.

Column W determines the probability (Pr Sell) of selling aggregate demand of *q* units or more given a normal distribution with the mean and the standard deviation in Table 1. The formula for Cell W11 (shown below) needs to be copied down to Cells W12:W970.

Cell W11: =IF(X11<>"",1-X11,"")
Column X determines the probability (Pr Not Sell) of not selling all *q* units given a normal distribution with the mean and the standard deviation in Table 1. The formula for Cell X11 (shown below) needs to be copied down to Cells X12:X970.

Cell X11: =IF(M11<>"",NORMDIST(M11,$B$7,$B$8,TRUE),"")

Table 5: Profit Calculations

	M	W	X	Y	Z	AA	AB	AC	AD
8							E Profit		E Profit
9	Order			Expected	Expected	Marginal	Including	Marginal	Excluding
10	Quantity (*q*)	Pr Sell	Pr Not Sell	Underage	Overage	Profit	External	Profit	Emissions
11	1	100.00%	0.00%	-$266.89	$0.00	-$266.89	-$266.89	-$264.31	-$244.31
12	2	100.00%	0.00%	-$119.74	$0.00	-$119.74	-$386.63	-$117.15	-$341.46
13	3	100.00%	0.00%	-$70.69	$0.00	-$70.69	-$457.32	-$68.10	-$389.57
14	4	100.00%	0.00%	-$51.20	$0.00	-$51.20	-$508.52	-$48.62	-$418.19
15	5	100.00%	0.00%	-$51.20	$0.00	-$51.20	-$559.72	-$48.62	-$446.80
16	6	100.00%	0.00%	-$51.20	$0.00	-$51.20	-$610.93	-$48.62	-$475.42
17	7	100.00%	0.00%	-$51.20	$0.00	-$51.20	-$662.13	-$48.62	-$504.04
18	8	100.00%	0.00%	-$51.20	$0.00	-$51.20	-$713.33	-$48.62	-$532.66
19	9	100.00%	0.00%	-$51.20	$0.00	-$51.20	-$764.54	-$48.62	-$561.28
20	10	100.00%	0.00%	-$47.89	$0.00	-$47.89	-$812.42	-$45.30	-$586.58

This table shows the probability of selling a particular unit (given the mean and standard deviation of demand), as well as the corresponding probability of not selling that unit. Expected Underage is the profit lost by not having this unit in stock (i.e., the marginal benefit from this unit). The Expected Overage is the marginal cost incurred by having this one unit left after the end of the selling season. Column AB shows the corresponding total profit where external (environmental costs are included in the model). Columns AC and AD shows the same information as columns AA and AB, but for the model that excluded emission costs.

Column Y determines the net expected underage cost from not being able to sell all *q* units demanded by customers. Expected Underage = Pr Not Sell * [Price per Unit – (Unit Cost + Shipping Cost per Unit + External Cost per Unit)]. The formula for Cell Y11 (shown below) needs to be copied down to Cells Y12:Y970.

Cell Y11: = W11*($B$5-N11-T11-V11)

Column Z determines the net expected overage cost from not selling all *q* units because realized demand was less than *q* units. Expected Overage = Pr Not Sell * (Unit Cost + Shipping Cost per Unit + External Cost per Unit + Holding Cost per Unit). The formula for Cell Z11 (shown below) needs to be copied down to Cells Z12:Z970.

Cell Z11: = X11*(N11+T11+V11+O11)

Column AA determines the marginal profit for selling *q* units. Marginal Profit is the net expected underage cost minus the net expected overage cost. The formula for Cell AA11 (shown below) needs to be copied down to Cells AA12:AA970.

Cell AA11:=Y11-Z11

Column AB determines the cumulative Expected Profit for a given *q* when including External Cost. E Profit = Sum of Marginal Profits. The formula for Cell AB11 (shown below) needs to be copied down to Cells AB12:AB970.

Cell AB11: =SUM(AA$11:AA11)

Column AC determines the marginal profit for selling *q* units without consideration of external costs. Marginal Profit is the expected underage cost minus the expected overage cost. The formula for Cell AC11 (shown below) needs to be copied down to Cells AC12:AC970. Note: In this cell, we combined the

underage and overage costs similar to those components in columns Y and Z, respectively, but without the emission costs from column V).

Cell AC11:= W11*($B$5-N11-T11)-X11*(N11+T11+ O11)

Column AD determines the cumulative Expected Profit for a given *q* when excluding external cost. E Profit is calculated the same as in Column AB, but external cost (i.e., environmental damage) in column V is removed. The formula for Cell AD11 (shown below) needs to be copied down to Cells AD12:AD970.

Cell AD11: =SUM(AC$11:AC11)

RESULTS

As shown in Table 1, the profit-maximizing quantity when considering external environmental costs and transportation costs is 531 units for an expected profit of $2,215.15. When external costs are ignored, the profit-maximizing quantity is 542 units with an expected profit of $3,601.41 (62.6% higher than when including external costs). When comparing the expected profits for the optimal quantity of 531 units, the expected profit when considering external costs is $2,215.15 versus $3,587.24 when ignoring external costs (for a 61.9% increase in expected profit when ignoring external costs). As expected, when environmental costs are considered, the optimal order quantity and the expected profit both decreased. However, as we pointed out in an earlier work (Manikas & Godfrey, 2010), the retailer might be motivated to focus solely on the economic bottom line unless faced with the prospect of a government policy requiring purchase of pollution permits or dictating emission penalties. Companies more focused on corporate social responsibility, however, would employ more of a triple bottom line approach regardless of government policy. Customers may demand that their suppliers embrace corporate social responsibility, or factors other than profit might drive a company's decision to include environmental costs in decisions.

DISCUSSION AND CONCLUSIONS

The goal of this paper was to present an Excel spreadsheet for a newsvendor model that included actual motor carrier freight rates and estimates of external environmental costs. We presented a model to handle stochastic demand and all relevant costs (i.e., purchase quantity discounts, LTL and TL freight rates, underage and overage costs) along with the profit-maximizing quantities (when considering or ignoring external emissions costs). A purchasing manager could change our spreadsheet to account for company-specific date, including estimates of external environmental costs. One limitation of our spreadsheet is the requirement to enumerate possible purchase order quantities. Future research could include modifying the current model using a continuous freight rate function, for price-sensitive demand, extending the model to include UPS package rates for low shipment weights or rail freight rates for heavy shipment weights, or using the buyer's own estimate of environmental costs. In addition, the model could be modified to select both a supplier and an order quantity simultaneously. Each of these models could incorporate company-specific transportation costs and external costs. As manufacturing moves overseas, thereby increasing transportation distance, the focus on green transportation is even more important to companies wanting to embrace the triple bottom line.

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BIOGRAPHY

Dr. Manikas earned his B.S. in Computer Science and his MBA in Materials and Logistics Management from Michigan State University, and his Ph.D. from The Georgia Institute of Technology. Prior to that, he was an instructor for supply chain optimization courses for i2 Technologies and worked as a management consultant for KPMG Peat Marwick, CSC, and Deloitte Consulting. Dr. Manikas is an Assistant Professor in the Management Department at the University of Louisville.

Dr. Godfrey earned his B.S. in Operations Management and M.S. in Management Information Systems from Northern Illinois University, and his Ph.D. in Production & Operations Management from the University of Nebraska - Lincoln. Dr. Godfrey is Department Chair of the Supply Chain Management Department at UW Oshkosh. He is a CFPIM through APICS.

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MODEL DESIGN OF MANAGEMENT COMPETENCES AND ITS IMPLEMENTATION PROCESS FOR SMES: DIAGNOSTIC EVALUATION OF THE RETAIL SECTOR

Melchor David Elizondo Sandoval, Universidad Autónoma de Coahuila. México
Jesús Alberto Montalvo Morales, Universidad Autónoma de Coahuila. México
José Luis Pérez Cardona, Universidad Autónoma de Coahuila. México
José Andrés Muñoz, Texas A&M University, USA
Luis Daniel Muñoz, Early College High School, USA

ABSTRACT

The changing and globalizing environment in business has resulted in increasing competition in markets and sectors. These factors drive the search for better strategic management tools that increase business results. SMEs are at the center of these changes with management needs and problems. These SMEs search for human capital with appropriate profiles and competencies that match the management requirements. The existence of this "competitive gap" is a barrier that impacts the survival and growth of SMEs. The present research proposes a model of managerial competencies and its implementation process. This model is easy to understand for SMEs, to increase the development of specific managerial competencies. The impact reduces the mortality rate and increase business as a result. The research methodology was exploratory, descriptive and propositional. The sample size was determined from a stratified probabilistic sampling with a 95% confidence level. The research instrument was applied to 371 partners and managers. The validity and reliability of the instrument was determined by Alfha de Cronbach with a score of 0.86. We propose a model of management competencies and its implementation is established with its own design. The methodology is new, non-theoretical in application, easy to understand, useful to SMEs, easy to use, and promotes the development of specific managerial competencies. The model is selected by the manager or partner. The model seeks to impact the stability and survival of SMEs in the Municipality of Saltillo in the State of Coahuila.

JEL: M10

KEYWORDS: Model of Management Competitions, SME

INTRODUCTION

Intellectual capital is an intangible organizational asset. Designing a model of managerial competencies specifically defines the profile of the human factor. It diagnoses, evaluates and develops managerial talent. The model must be dynamic, comprehensive and flexible and incorporate characteristics that are part of good management practices.

SMEs adapt to face their future. Integrating the most competent managers means the possibility of stabilizing their operation and developments in a competitive environment that requires adaptation and rapid strategic decisions. Few SMEs base their management of human capital on managerial competencies. Some authors claim (Soto. 1999, Whetten and Cameron. 2011), that today's organizations demand highly competitive management professionals not only in the administrative process and functional areas, but also in developing a holistic view of human capital including social, economic, and organizational aspects.

Managers must be aware of change, systemic thinking and possess managerial skills. Know-how is in the human factor. This human factor is intangible, and the biggest concern of organizations regardless of size or sector. The operational and managerial challenge is to resolve problems that impact business performance. OCDE (2013), in its report Latin American Economic Outlook and SME Policies for Structural Change confirms that barriers that impede the productivity growth of SMEs are very diverse.

One dimension the literature recognizes as essential to understanding the productivity of an economy is the provision of human capital and managerial competencies for the productive sector. Studies on human capital and labor markets coincide in pointing out an additional factor that must be analyzed to understand the low productivity of SMEs. This factor is the gap between the knowledge provided by the education system and the skills that are demanded by the productive sector.

Many SMEs face problems in finding managers with appropriate skills, so it can be argued there exists a skill gap that acts as a barrier to productivity growth. This phenomenon is expressed in different ways and reflects the profound heterogeneity of SMEs in Latin America. Depending on factors including size, sector or geographical location, these companies require specific skill types and have varying degrees of difficulty finding them (OECD 2013, p.142). In Mexico there are 4,410,198 formal enterprises, 95.2% are microenterprises and 4.6% are small and medium enterprises that contribute 33.6% of employment, 6% of GDP and 2% of investment. At the national level in Mexico, SMEs generate 5% of GDP and 42% of employment. (INEGI 2014).

Velázquez (2008, p.75) argues that in Mexico "at the age of 10, only 10% of companies mature, succeed, and grow." According to Centro-CRECE, 75% of new Mexican companies should close their operations after only two years in the market. According to ECLAC (2010), SMEs are characterized by a high mortality rate. By comparison, only Argentina (93%) has a higher mortality rate than Mexico (75%)for the second year. The problem posed for this research is weak management and in particular, the lack of professionalization of SME managers in the region.

In the trade sector, most of the focus is on the manufacturing or industrial sector (Velarde, 2014, Martínez, 2010, Chinchilla 2001, Medina et al., 2012 and Delgado 2005 as quoted in Elizondo (2014). Thus, this research provides a significant contribution. We present a profile design of managerial competencies and their implementation. The data provided serves to integrate a strategic tool in the management of an SME in the trade sector. The results here will influence the mortality rate of SMEs and the stability of their financial and non-financial indicators.

The work is structured in three parts. We begin with a review of the literature. Next, we discuss the methodology used in the empirical study. The study continues with a design of the profile of managerial competencies and their implementation. The paper closes with some concluding comments.

LITERATURE REVIEW

Chronology of the Competencies Concept

Elizondo, Armenteros, Guerrero and Barquero (2012) comment on 1960s research by McClelland at Harvard University. McClelland (1973) attributed the success of individuals in their work more to the person's own characteristics and their competencies, rather than to aspects such as knowledge and skills. However, knowledge and skills are used as the main employee selection factors. This led him to look for new variables, which he called competencies, that would allow a better prediction of work performance. Therefore, competencies are linked to a way of assessing what actually causes superior performance at work rather than the evaluation of factors that reliable describe all the characteristics of a person, in the hope that some of them are associated with performance on the job (p.81). McClelland began his studies in

1953 and published his motivational theory (power, achievement and motivation) when he joined the McBer company in 1970. He studies successful diplomats and identified three significant competencies for job success: transcultural empathy, positive expectation (self-confidence) and the speed of understanding the networks on influence. McBer defines his competency model, which is fueled by the contribution of Boyatzis (1982) on his theory in his pioneering study of the competent managerial function "Competent Manager: A Model for Effective Performance".

In the 1990s the McBer group commercialized the technique and it suffered a decade of criticism and debate in Europe and the USA. At the same time Spenser, L. and Spenser, S. (1993) presented their work on "Competences in the Work: Models for a Superior Performance". The United Kingdom National Council for Vocational Qualifications (NCVQ) focuses its emphasis on standardization of charges from an initiative by the British government which pushes McClelland's original idea out of hand. In Latin America the proposals of Chinchilla (1999) Psico Consult (2001) and Alles (2002) are interesting contributions. Ross, Dragonetti and Edvision (2001), as quoted in Medina et al. (2012), states that in a strategic approach to human capital, value comes from competence, attitude, and intellectual agility. Competence is the capacity that generates value through knowledge, skill, talent. Know-how constitutes the potential for the organization. Attitude is manifested in the behavior of people, in their willingness and commitment to achieve goals. Intellectual agility is the capability to adapt, innovate, and transform ideas into new and improved products, processes, and trade (p.83).

Robbins (2009), noted that managerial competencies are the set of knowledge, skills, and associated attitudes that relate to good performance of the manager. They are associated in the labor field with basic and administrative skills, which are fundamental processes learned through life and are converted into habits through organizational behavior, which motivate people to achieve results. However, there must be a rational balance for success. Nowadays, competences are understood as integral actions to identify, interpret, argue, and solve problems. These actions occur with suitability and ethics, integrating knowing, doing, and being (Tobón, Pimienta y Garcia, 2010). Vázquez (2013) states that we can summarize seven characteristics of Competences: 1.) Competencies are a set of behaviors that some people master better than others, which makes them effective in a given situation. 2.) They are personal attributes: knowledge, skills, aptitudes, character, traits, and concepts of oneself. 3.) They are causally related to actions that produce successful results. They manifest in the action through behaviors that can be observed. 4.) They are characteristics underlying the person that function as an interactive and globalizing system; as an inseparable whole that is superior and different from the sum of individual attributes. 5.) They achieve results in different contexts. 6.) Competencies represent the link between the individual characteristics and the qualities required to carry out precise professional missions. 7.) They represent dispositions to act in situations, to problems or demands of very different contexts.

PROPOSED COMPETENCIES FOR BUSINESS MANAGEMENT

SCANS (1992)

The SCANS model is a proposal relating to concern over the challenges that the new demands of the labor market makes on people with respect to the directives (Scans Report, 1992). This report was prepared by the Secretary's Commission on Achieving Necessary Skills (SCANS), which is a partnership between the Department of Education, Labor, and the Office of Personnel Management. It was based on interviews and discussions with a large group of key informants from the trade union business, education, academia, and field specialists. They were asked to identify the major areas of skills needed to get a job. They defined five competencies present in effective managers, and a foundation: 1.) Resource management: Time, money, materials and distribution, and personnel. 2.) Interpersonal relationships: Teamwork, teaching others, serving clients, deploying leadership, negotiating and working with diverse people. 3.) Information management: Search and evaluate information, organize and maintain information systems, interpret and

communicate, and use puters. 4.) Systemic understanding: understanding complex interrelations, understanding systems, monitoring and correcting performance, improving or designing systems.

Hay Mcber – Spenser and Spenser (1993)

Adams (1996) confirms that "over twenty years more than one hundred researchers have produced a total of 286 generic competition models, two-thirds are American, and the rest spread over twenty countries." "Each model had between three and six groups or clusters with two to five competencies per group, and three to six indicators of behavior which demonstrate competence in the position." Of this total, a comparative analysis was completed and 21 competences were obtained (1. Orientation to the Attainment, 2. Concern by Order, Quality and Accuracy, 3. Initiative, 4. Search of Information, 5. Interpersonal Comprehension, 6. Orientation to Customer Service, 7. Impact and Influence 8. Organizational Awareness 9. Relationship Establishment 10. Other Development 11. Assertiveness and Use of Positional Power 12. Teamwork and Cooperation 13. Team Leadership, 14. Analytical Thinking, 15. Conceptual Thinking, 16. Expertise, 17. Self-control, 18. Self-confidence, 19. Flexibility, 20. Organizational Commitment, 21. Other Competencies) with 360 indicators that were embodied in a behavioral dictionary for management effectiveness. From this result Hay McBer and Spenser and Spenser (1993) list 21 basic competences which integrated into 6 groups: Achievement and action, Human support and service, impact and influence, management, cognitive, and personal effectiveness.

Chinchilla (1999)

In the environment of SMEs there is always the big question of whether to train managers and administrators, due to the high turnover. However, an untrained manager or administrator will lack the habits and behaviors necessary for achievement and efficient performance of the SME. Chinchilla (2001) classifies the competences in techniques and directives. He defines the techniques as attributes or definitive traits required by an exceptional worker in a job. The directives are observable and habitual behaviors that justify the success of a person in its directive function. Managerial competences are of personal effectiveness (habits that facilitate a relation of the person with its environment such as: initiative, creativity, autonomy, discipline, concentration, self control, time management, self-knowledge, and personal change). They refer to managerial profile in the strict sense and classify them into strategic areas, because they guide economic results such as business vision, problem solving, resource management, client orientation, and network relationships effective and negotiated. Intra-techs complete intra-technical competencies such as communication, organization, empathy, delegation, coaching and teamwork. To determine what these behaviors are, it is necessary to go deeper into what the directive function means. Following the anthropological model proposed by López (2006), "the management function is to design strategies that produce economic value, developing the capabilities of its employees and joining them with the mission of the company."

Alles (2005)

Alles (2002) states that "mental or cognitive competences include analytical thinking (information and data processing, determination of cause and effect, organization of data plans) and conceptual thinking (recognition of characteristics in complex data). The type or level of competence has practical implications for human resource planning. Competences of knowledge and skill tend to be visible and relatively superficial features. The competences of concept of self, characteristics and motivations are more hidden. They are more in the personality. Knowledge and skill are relatively easy to develop. The most economical way to do this is through training. Motivational competencies and characteristics are more difficult, from the point of view of personality, to evaluate and develop."

Alles (2005) states that Spenser and Spenser (1993) introduce the "Iceberg Model", where they graphically divide competences into two large groups. The easiest to detect and develop, are skills and knowledge, and the least easy to detect are the concepts of oneself, attitudes and values and the very core of the personality. In this scheme the competences are central and superficial.

The Application of a Level Competency Scheme

Alles (2003) defines degrees and proficiency profiles, providing an explanation of each of the levels used as follows: A.) Higher top performance. According to Spencer and Spencer there is a standard deviation above the average performance. Approximately one in ten people reach the top level in a work situation. B.) Well, above the standard. C.) Minimum required for the position but within the required profile. Grade C in this rating relates to Spencer and Spencer's definition of effective performance: this generally means a "minimally acceptable level of work. It is the point that an employee must reach; otherwise, he would not be considered competent for the position. It does not indicate an undervaluation of competition. D.) Unsatisfactory. This level does not apply to the profile description, since this competence is not necessary for the position, it is not necessary to indicate the level.

As a subject develops to more demanding levels, the required competencies or their specific importance changes depending on the position for the Executive Levels of people with experience and work history. Alles (2003) established the following competences: Development of team, modalities of contact, media skills, leadership for change, strategic thinking, empowerment, dynamism-energy, portability/cosmopolitanism/adaptability, public relations, customer orientation, team, results orientation, integrity, initiative, entrepreneurial, and competition of the castaway.

Model of Competencies of Psico Consult and the Competence Wheel (2001)

The competence model has integrated into multidimensional and contextualized variables. Competences are multidimensional because they involve the conjugation of knowledge (theoretical knowledge), skills (knowing how to do, and how to bring theory to practice), and attitudes (what the person wants to do) which are contextualized because they are only observable in a determined environment and under certain conditions. Psico Consult C.A., affirms that there are benefits for the management by competences in A.) Lower costs and more production, B.) Management Advantage, C.) Motivated and committed employees, D. Increased effectiveness, E.) Facilitates changes and improves climate and F.) Greater permanence in the market.

Once the company has its own Competency Catalog and its Competency Charge Descriptions Manual, you can start applying it to all human resources sub-systems such as recruitment and selection, training, evaluation (using criteria of 360 degrees), plans of succession and others. The circular proposal called The Competency Wheel is composed of 40 competences with three classifications: technical and functional, personal, and administrative management. This defines the techniques and functions as generic and specific knowledge of the position. It defines personal as cognitive, motivation and commitment. Finally, the administrative and managerial area is communication with people, administration, and leadership. Our study of managerial competencies focuses on the latter group. Psico (2001) creates lists the following specific competencies: A.) Communication: listening, reporting, writing reports, and searching for information. B.) With people: conflict management, personal relationships, and teamwork. C.) Administrative: monitoring, effectiveness of resources, organization, and planning. D.) Leadership: people development, delegation, control, motivation, style, and leadership impact. Psico Consult C.A. (2001), argues that implementing a competency model develops organizations and therefore individuals and work teams.

Model of Cardona and García Lombardía (2009)

Cardona studied leadership in three main lines including the leader's personality, leadership styles, and relational approach. Each line includes different authors, models, theories, and proposals. Derived from this, Cardona and García Lombardía (2009) developed and defined their model and competencies as observable and habitual behaviors with a focus towards action and leading to the success of a function or task. They established that competences should be behaviors, not traits of personality, nor knowledge. They should be observable and measurable. They can be learned and developed regularly and can be part of the person's daily actions and habit forming to lead the success of a function. The model is based on the idea that a leader is not born, it is done.

Categories of competences include: business, interpersonal, interpersonal skills include communication skills, conflict, management, charisma, delegation, coaching, and teamwork. External personal competences are divided into two groups, pro activity and personal management. The first includes initiative, optimism and ambition. The second contains the skills of time management, information management and stress management. Internal personal competences are divided into two groups, personal improvement and self-government. Personal improvement has the skills of self-criticism, self-knowledge, and learning. Self-governance includes decision-making skills, self-control, emotional balance, and integrity. Cardona and Wilkinson (2009) defined business competencies as "aimed at achieving economic value for the company." These competencies are shown in the relational approach of leader characteristics through so-called "transactional", "transformational" and "charismatic" traits.

Model COMPETE (2010)

The model of Compete (2010) has a general objective of presenting new transversal competencies required by those responsible for business management in companies. The specific objectives are: A.) To diagnose the needs of qualifications related to transversal competences. B.) Identify the basic competences of special interest for good business management not rooted in the reference group. C.) Detect and define new necessary and specific transversal competencies of the managers in the framework of the new economic model based on knowledge management. D.) To propose formative actions for the qualification of the collective in these new competences. E.) Develop a Guide for the development of basic skills of business managers.

The model COMPETE (2010), is approached from a qualitative perspective, and the following techniques have been applied: Documentary analysis, interviews of experts, interviews of critical incidents and discussion groups. It defines those responsible for business management in companies by differentiating between to levels, depending on the managerial functions performed: Level 1 is High Management, with functions to formulate global objectives, and the determination of strategic plans for the achievement of these objectives. Level 2 is Intermediate Direction, with functions of technical and operative type, relative to the fulfillment of the plans and programs, that would correspond to Intermediate Controls.

COMPETE (2010), presents a diagnosis of the qualification needs of those responsible for business management. Based on a methodology based on competences and management styles, this work identifies deficiencies in the rooting of these competences as evidenced by the repertoire of behaviors that define them. Each competency is analyzed in the behaviors associated to each of the competencies. The work analyzes the level of rooting of new transversal competences in those responsible for business management. COMPETE (2010), are the strategic competencies that present a greater degree of development, in the two managerial profiles analyzed, highlighting customer orientation, negotiation and the network of relationships.

On the contrary, the competences of interpersonal character present a lower level of development in the demonstrated behaviors. Except for delegation, which presents an optimum level of performance, competences such as team management, coaching or teamwork have manifested themselves at their most basic levels. Regarding personal efficacy skills, personal change, learning, self-control, and balance with a moderate level of development are highlighted. It is necessary to emphasize that communication and time management competences presented the lowest levels and, therefore, are both deficient in their influence on improvement and development.

Table 1: Comparative Proposals of Competences Directives

Element	**Scans 1992**	**Hay McBer 1993**	**Chinchilla 1999**	**Psico Consult 2001**	**Alles 2003**	**Cardona 2009**	**Compete 2010**
Competency Groups	Management of means. Relationships Interpersonal. Management of Information. Understanding Systemic. Domain technological.	Achievement and Action. Support and Human. Services Impact and Influence. Management. Cognitive. Effectiveness Personal.	Internal studies. Personal Effectiveness. Strategic.	Techniques and Functions. Personals. Directives.	Cardinals. Executive Levels . Intermediate Executives Levels. Initial levels. From knowledge. Competencies	Business. Interperson les. External Personal. Internal Personal.	Strategic. Interpersonal. Personal Effectiveness.
Theories that Sustain it	Classical theory of Competencies Directives, leadership, behavioral psychology	Theory of Motivation of McClelland, Leadership, Psychology Behaviorist, Model of analysis Situational	Analysis Strategic, Leadership, Psychology Constructivist	Leadership, Psychology Constructivist, Analysis model Situational. Culture Organizational	Theory of Motivation of McClelland, Analysis Strategic, Leadership, Psychology, Constructivist, Iceberg Model	Leadership, Psychology Behaviorist, Model of Analysis Siutational	Theory of Motivation of McClelland, Leadership, Psychology Behaviorist
Methodology of building	Interview-Discussion-Identification – Definition of Competences	Motives and Social Behaviors-Applications-certification Occupational	Define the Model Selection-Performance-Development	Analysis-Design Application	Define Mission Vision- Define Competencies-Validation test-Design of Processes	Leader is made-Habits- Success labor	Forces qualitative, Analysis Documentary film, Interviews with Experts, Interviews of Critical Incidents and Discussion Groups
Vision of the Person	Humanistic / Social Man: Empathy of the competencies of the individual, the company and the technology	Humanistic Psychological /Social. Man: Creator, Innovative, Leader, Entrepreneur, Line up Organization with your vision	Humanistic /Social Man: Agent Exchange, Potentialize the "do" at work, Ecology of Man	Humanistic / Social Man: Evolution according to the company and the technology.	Humanistic Psychological Man: innovative, leader, Entrepreneur Owner of Competences and coefficient emotional	Humanistic / Social Male: Leader, Successful managerial performance due to the relational approach	Humanistic / Social Male: Evolution according to the company and the technology
Competencies	The competencies Work managers needed for job success based on experience and training	The Competencies are in people, experts are needed to identify them.	Observable and habitual behaviors that make possible the success of a person in its	The abilities demonstrated by the person for contribution to the satisfaction of the customer and	Competence refers to the personality characteristics, resulting in behaviors, that	Competencies must be behaviors, be observable and measurable; learn and	Those behaviors observable and usual justify success of a person in their

		The high direction defines the performance upper and specific criteria	directive function	the improvement continues the processes of quality and efficiency	generate a successful performance in a job	develop regularly; and lead to the success of a function	activity or function
Total Competencies / Directive Competences	14/11	18/08	18/13	40/17	16/10	14/10	16/16
Country of Origin	United States	United States	Spain	Venezuela	Argentina	Spain	Spain
Main feature of the proposal	Competencies Labor generated by specialists, Entrepreneurs and Academics	Functional environment In order to Certify	Strategic Based on selection of staff and your development	Flexible to organizational culture and practices with a focus on quality, efficiency and organizational performance. Design of unique models from key processes	Levels Organizational From one Redefinition of Mission and vision	Flexible model that gives special relevance to the self-knowledge of the competences and gives importance to the aptitude and the attitude of the competition	High Levels Address and Intermediate Address

Table 1 shows a summary of seven proposals for competency models based on the most important elements of each proposal: Competence Groups, theories that support it, construction methodology, personal vision, definition of Competence, total competences and the sum of managerial competencies, country of origin and main characteristic of the proposal. Table 1 shows that of the seven model proposals: three have three groups of classification of the competences, two models have six groups of competences, two proposals have five and six groups respectively. Of the seven proposals we find in the classification of Competences similar between Psico Consult, Chinchilla, and COMPETE. The classification of Alles is a proposal of Competences by Levels with groups towards innovation (knowledge) and technology (e-competencies). Four models are supported theoretically in the conductivist approach and three in the constructivist approach. Source: authors

Each proposal has its own construction methodology such as: Interview, discussion, identification, definition of Scans, motives and social behaviors, applications, occupational certification (Hay McBer), define model, selection, performance, and development (Chinchilla), analysis, design, application (Psico Consult), define mission and vision, define competencies, validation test, process design (Alles), the leader is made, habits and work success (cardona) and qualitative approach, documentary analysis, interviews to experts, critical incidents and discussion groups (Compete). The vision of the person is based on a social and humanistic view of man. The country of origin of the proposals are three from Spain, two from the United Sates, and one each from Argentina and Venezuela. With respect to the Construction Methodology, Psico Consult has a friendly process considering only three phases: diagnosis, design, and application. Psico Consult has the main characteristics of being flexible to the organizational culture and practices with focus of quality, efficiency, and organizational performance and to design unique models from key processes. For the purposes of our research, the Psuco Consult classification allows us to diagnose and propose a design of directive competences for the commerce sector.

In addition to the models previously studied, we detail the specific competences of other authors to find similarities as shown in Table 2. Each model proposes specific managerial competencies. We believe that the models of Directed Competences Investigated and Psico Consult offer a greater number of specific Directives Competences (17). Gutierrez, Villanueva, and Casas present 15 of these compentencies; Charlo and Núñez 14; Chinchilla, Thorton, and Byham 13. Specific Customer Service directives are mentioned in 11 models studied and Coaching is referenced in 10 models.

As shown in Table 2, Customer Service and Coaching are Specific Directives competences considered by a significant number of authors. We add them to the 17 previously selected Psico Consult (2001) model competencies which forms a new proposal of 19 Competencies Specific directives (Figure 1).

Figure 1: Proposed Management Skills for SMEs

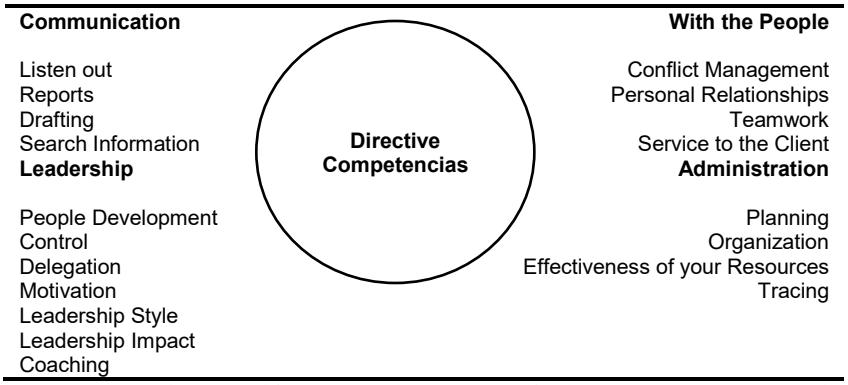

Figure 1 presents the proposal for managerial competencies, for the SMEs sector Commerce. These competencies were based mainly on the model of Psico Consult (2001) which forms a new proposal of 10 Specific Directives in four generic competences. The design of the proposal establishes the relationship of competences in generic axes and allows the adaptation of SMEs in the sector based on their own needs. The success of the proposal is that it be flexible and adaptable. Source: the authors.

METHODOLOGY

This section describes the origin and basis of the exploratory, descriptive, and proactive work of the research. Our goal is to design a methodology that is easy to understand and adaptable to SMEs. We believe this approach will promote the development of specific directives that will reduce the mortality rate and improve stability of firms in the region.

The research uses specified study subjects and locations, instrumented reliability, subject study population, sample size. We describe the instrument and the basis of its design along with variables. We use descriptive techniques and Chi-square tests for the processing of sampling data. Finally, the sample size is calculated.

The research process was based the problem and objective of the study. The bibliography of the authors that are referenced was selected and investigated. Thirdly, the research was designed and instrumented to validate the sample to study subjects. The exploratory stage was application of 371 surveys that produced a response rate of 90%. Using this data we describe and assess managerial competencies. The proposal section involves designing a profile of managerial competences for the SMEs sector, retail trade. The result of the literature review and the application of the instrument led to the design of a proposal for Directive Competencies and its evaluation. We specifically focus on the commerce SMEs sector in Saltillo, Coahuila and its methodology of implementation.

The research developed here is an exploratory, descriptive, and prepositive analysis based on the following justification. Exploratory research "is the research design that has as primary objective to facilitate a greater penetration and understanding of the problem faced by the researcher" (Malhotra, 1997). It is descriptive because "it is the type of conclusive research that has as main objective the description of something, generally the characteristics or functions of the problem in question" (Malhotra, 1997). The research seeks to deal with research lines of faculties that depart from a diagnosis. Set goals and strategies are designed to reach them to solve problems at the local and global level (Del Rincon, 1995).

The study subjects were owners, managers, and supervisors of firms in the SMEs sector, trade, in Saltillo, Coahuila. Participants were asked their perception of each question. We use a Likert scale from 1 (unfavorable) to 5 (favorable). A total of 371 surveys were applied directly from January to April 2017. Reliability of the instrument was identified using Cronbach's alpha coefficient. We obtained a value of 0.80 which is considered a good value. Values of 0.60 to 0.70 are considered the lower limit of acceptability (Hair, Anderson, Tatham, and Black, 1999).

Table 2: Comparison of Specific Competences of Different Authors

Generic Competences		Specific Competences	Thornton and Byham (1982)	Dulewicz (1989)	McCauley (1989)	Bouygues (1989)	Scans (1992)	Spenser and Spenser-Hay McBer (1993)	Chinchilla (1999)	Psico Consult (2001)	Alles (2002)	Urdaneta (2005)	Cardona , García Lombardía y Wilkinson (2009)	Compete (2010)	Gutiérrez (2010)	Villanueva and Casas (2010)	Charlo and Núñez (2012)
Communication	1	**Listen**	X						X	X		X	X	X	X	X	X
	2	**Reports**	X				X		X	X		X	X	X	X	X	X
	3	**Drafting**	X				X		X	X		X	X	X	X	X	X
	4	**Search Information**	X				X	X	X	X		X	X	X	X	X	X
With the People	5	**Conflict Management**	X	X	X		X		X	X		X	X	X	X	X	X
	6	**Personal Relationships**		X	X		X	X		X	X			X			X
	7	**Teamwork**		X	X		X	X	X	X	X		X	X	X	X	
Administrative	8	**Tracing**						X		X							
	9	**Effectiveness of your Resources**					X		X	X			X		X	X	
	10	**Organization**	X							X		X			X	X	X
	11	**Planning**	X							X		X			X	X	
Leadership	12	**People Development**	X	X	X		X	X		X	X	X			X	X	X
	13	**Delegation**	X							X	X	X	X	X	X	X	X
	14	**Control**					X		X	X	X						X
	15	**Motivation**								X							X
	16	**Leadership Style**	X			X		X	X	X	X	X			X	X	X
	17	**Leadership Impact**	X			X	X	X	X	X	X	X			X	X	X
Considered by other models	18	**Service (orientation) to the Client**	X	X	X		X	X	X		X		X	X	X	X	
	19	**Coaching**	X	X	X				X			X	X	X	X	X	X
	20	**Strategic Thinking**	X								X	X		X	X	X	
	21	**Entrepreneur**									X						
	22	**Organizational Commitment**												X			
	23	**Change and Learning**	X	X	X									X	X	X	X
	24	**Problem analysis**	X									X		X	X	X	X
	25	**Time management**					X						X	X			X
	26	**Decision making**	X			X							X	X	X	X	
	27	**Stress Management**		X	X								X				
	28	**Achievement orientation**	X	X	X										X	X	
	29	**Technology Domain**					X									X	
	30	**Networking**				X	X						X				

The first column of Table 2 describes the generic competences (communication with people, administrative, leadership and competencies referenced by other models. These models include Thornton and Byham (1982), Dulewicz (1989), McCauley (1989), Bouygues (1989), Scans (1992), Spenser and Spenser-Hay McBer (1993), Chinchilla (1999), Psico Consult (2001), Alles (2002), Urdaneta (2005), Cardona, Garcia Lombardia and Wilkinson (2009), Compete (2010), Gutierrez (2010), Villanueava and Casas (2010), and Charlo and Núñez (2012). Each competition marked with an X was considered by each respective author. Tthe most referenced articles are used to integrate the specific proposal of skills in our study. Source: The authors.

The study population consists of all SMEs in the retail trade sector, which includes 10,605 economic units in the Municipality of Saltillo in the State of Coahuila (INEDI, 2017). Sample size estimation was obtained

from a stratified probabilistic sampling with a 95% confidence level by maximum variance. The instrument used included socio-demographic control variables such as age, gender, education, position, seniority, size, stage, and subsector. We used descriptive techniques and Chi square tests to determine the level of significance with a 90.95 and 99% confidence.

Based on the literature review, we developed an instrument based on the Model Competence Wheel of Psico Consult A.C. (2001). We added validated questions to the MSME Strategic Development questionnaire regarding the use of formal internal control systems and sectorial environment (FAEDPYME, 2009, Medina 2011, Martinez Serna, et al, 2012 and Elizondo 2014), and business performance based on variables proposed by Quinn and Rohrbaugh (1983). Table 3 shows the total variables of this study.

The result of the literature review and the instrument application led to the design of a proposal for Directives and its Evaluation for the SME sector commerce in Saltillo Coahuila and its methodology of implementation.

Table 3: Operationalization of Study Variables

Variable	Indicators	Items	Alpha*
Communication Skills	Listening, executive reports, writing, and information search	12	0.887
Competition with People	Conflict Management, Personal Relationships, Teamwork, and Customer Service	12	0.894
Administrative Competence	Monitoring, resource effectiveness, organization, and planning	12	0.899
Administrative Competence	People development, delegation, control, motivation, leadership style, leadership impact, and coaching	21	0.942
Sectoral Environment	Facility to enter new companies, competition among companies in the sector, bargaining power of customers, bargaining power of suppliers and substitute products	5	0.694
Company Profiles	Quality of the product, efficiency of internal processes, organization of personnel tasks, customer satisfaction, speed of adaptation of the needs of the markets, image of the company and its products, market share, profitability, productivity, motivation of the workers, satisfaction of the workers, permanence of the personnel, assistance and punctuality of the personnel	13	0.899
Internal Control	Quality of service, cash flow, budgets, economic-financial analysis, internal audit and quality system	6	0.859

Cronbach's alpha is between 0.7 and 0.9 in 6 variables so it is be at an acceptable level for most variables. According to Hair, Anderson, Tatham and Black, (1999), the sectorial competitive environment obtained a Cornbach's Alpha of 0.69 to 0.70 which is considered the lower limit of acceptability. Table 3 shows the operationalization of study variables used in the instrument design. It is based on the Competence Wheel of the Model of Psico Consult A.C. (201). We add validated questions from the MSME Strategic Development questionnaire regarding the use of formal internal control systems and sectoral environment alongside business performance based on variables proposed by Quinn and Rohrbaugh (1983).

Table 4 shows the population of the study. The sample includes all SMEs in the retail trade sector (10,605) of the Municipality of Saltillo in the State of Coahuila (INEGI, 2017). The sample size estimation was obtained from the stratified probabilistic sampling, with a 95% confidence level by maximum variance.

$$n = \frac{\mathrm{Npq}}{\frac{(N-1)B^2}{(Z)^2}} + pq \qquad (1)$$

$n = 371$

Owners, managers, and supervisors of SMEs in the retail trade sector of the municipality of Saltillo in the State of Coahuila, were asked to participate in the study. They indicate their perception of each question with a scale of 1 (total disagreement) to 5 (total agreement), 1 (poor) to excellent (5), deficient (1) to efficient (5), and little use (1) to much use (5). The total number of surveys distributed was 371, in the period from January to April 2017. Reliability of the instrument was examined using the Cronbach Alpha coefficient. The research instrument included socio-demographic variables (age, sex, schooling, respondent's rank, seniority in the company, size, and subsector). Descriptive statistical techniques were used and Chi square tests determined the level of significance with 90, 95, and 99%, confidence.

Table 4: Population of Total Economic Units and Application So Sampling of SMEs Retail Trade Sector of The Municipality of Saltillo of the State of Coahuila

Sub-Sector	Activity	No. Economic Units	Sample
461	Groceries, food, drinks, ice and tobacco	4,994	157
462	Self-service and departmental	570	25
463	Textiles, costume jewelry, clothing accessories and footwear	1,162	28
464	Health care	432	28
465	Stationery, recreation and other articles of personal use	1,440	43
466	Household appliances, computers, interior decoration and used articles	813	21
467	Hardware store and glasses	558	40
468	Motor vehicles, spare parts, fuels, and lubricants	628	25
469	Internet commerce, catalogs, print, television, and alike	7	4
Total		**10,604**	**371**

Table 4 shows the retail trade sector with subsectors in the second column. The number of economic units in the grocery, food, beverage, ice and tobacco (4,994), stationery, leisure, and other personal items (1,440) and textiles, costume jewelry, clothing and footwear (1,162) sub-sectors are significant. These sub-sectors represent 71.63% of the total economic units. The sample size of the investigation (371) was obtained from stratified probabilistic sampling, with a confidence level of 95% by maximum variance.

RESULTS

Demographic Description

The characteristics of the owners, managers, and supervisors that make up the sample are as shown in Table 3 which indicates: 49% are owners, 31% are seniors of 1 to 4 years expeience, 47% have a university degree and 10% have a graduate degree. The sample is mostly male (55%) and with an age of less than 40 years (49%) and 40 to 55 years (40%). Among those employed as a manger or director, 64% are male. Some 30% of the sample have experience in management positions from 1 to 4 years. 28%, from 5 to 9 years and 30% with more than 10 years. SMEs in the retail trade sector who participated in the empirical study include the subsectors grocery, food, beverages, ice and tobacco (42%), stationery, recreation and other articles for personal use (12%) and hardware and glassware (11%). Company stage of life is more representative with 61% in maturity, 40% consolidated and 33% in the development stage.

The overall leadership competency has the top ten specific competencies rated into four categories: motivation, control, leadership style, and delegation. On the other hand, generic competition with people has four specific competencies of the first ten most valued competences: customer service, conflicts, personal relationships and teamwork. Least valued are the general competence of communication: reports, writing and search for information. Respondents perceive the specific competences reports, writing, information search, people development and coaching as unimportant. This may be related to the numerous communication and leadership problems that create a limited culture of management skills in communication and leadership in SMEs allocated in the retail trade sector.

These findings allow us to infer that SMEs in the retail trade sector prefer managers, supervisors, and directors with specific managerial competencies that resolve conflicts, with a focus on customer service, promoting teamwork and the ability to relate easily. Firms want a leadership style that impacts the performance of results with motivation, control, and delegation. Recall that Chinchilla (2001) concluded

that companies look for managers capable of creating teams, developing collaborators, and having qualities of leadership and motivation.

Table 5: Self-Evaluation of Competences Directives of Partners, Managers and Supervisors of SMEs Sector Retail Trade

Directive Competencies			**Place**	
General	**Specific**	**Media**	**General**	**Specific**
Communication	Listen out	3.96	11	3.62
	Reports	3.31	19	
	Drafting	3.50	18	
	Search Infromation	3.71	17	
With the People	Conflicts	4.03	6	4.02
	Personal relationships	4.00	8	
	Teamwork	3.96	10	
	Customer Service	4.10	2	
Administrative	Tracing	4.05	5	4.00
	Resource Effectiveness	3.93	14	
	Organization	4.07	3	
	Planning	3.94	13	
Leadership	People Development	3.89	15	3.97
	Delegation	3.98	9	
	Control	4.06	4	
	Motivation	4.11	1	
	Leadership Style	4.00	7	
	Leadership Impact	3.95	12	
	Coaching	3.83	16	

Table 4 shows the self-assessment of managerial competencies of SME owners, managers, and supervisors in the retail trade sector. The 3 best self-evaluated specific competences are: motivation, customer service and organization. Management competences from lower to higher are: reports, writing and search for information. The generic communication competence communication turned out to be the one with the lowest self-evaluation.

Economics, technological, social, and environmental trends, among others, as well as those of the industrial sector play a significant role during the process of strategic planning and its medium- and long-term projection. This occurs especially in conditions of turbulence, instability and risks. For this reason, it is important to identify the perception of managers and/or directors of MSMEs based on the model of the five competitive forces of Porter (2008 p.25). Porter's five competitive forces (1980 p.350) is a powerful analysis methodology that allows us to identify the main characteristics of the competitive environment in which SMEs develop their activities. It allows research on the structure of the industry, pointing out the opportunities and threats that SMEs face when competing within their specific environment.

López, Medina, and Armenteros (2016), in their empirical research of 704 entrepreneurs or directors/managers of micro, small, and medium enterprises (MIPYME) found sector competition equaling 3.95, negotiation power of the client 3.51, entry of new companies 3.40, substitutes 2.71, and bargaining power of suppliers 2.68. The similarity in most of the results regarding competitive forces of the sectorial environment in the retail trade sector is inferred. In relation to the study of Lopez, Medina and Armenteros (2016), and our research, as shown in Figure 2, we observe a similarity in the variables. We find a high competition among the companies of the sector (3.95 to 3.80), bargaining power of the clients (3.51 to 3.58) and ease for new businesses (3.40 to 3.57). Similarity is observed in most of the results regarding the competitive forces of the sectoral environment of the State of Coahuila with the Municipality of Saltillo in the retail trade sector. When measuring the perception of SME business results, shown in Table 6, we find that quality of service, customer satisfaction, profitability, and productivity are the ways in which SMEs, in their sectorial environment, face competition.

Figure 2: Perceptions of the Competitive Sector Environment SMEs Sector Retail Trade in Saltillo Coahuila

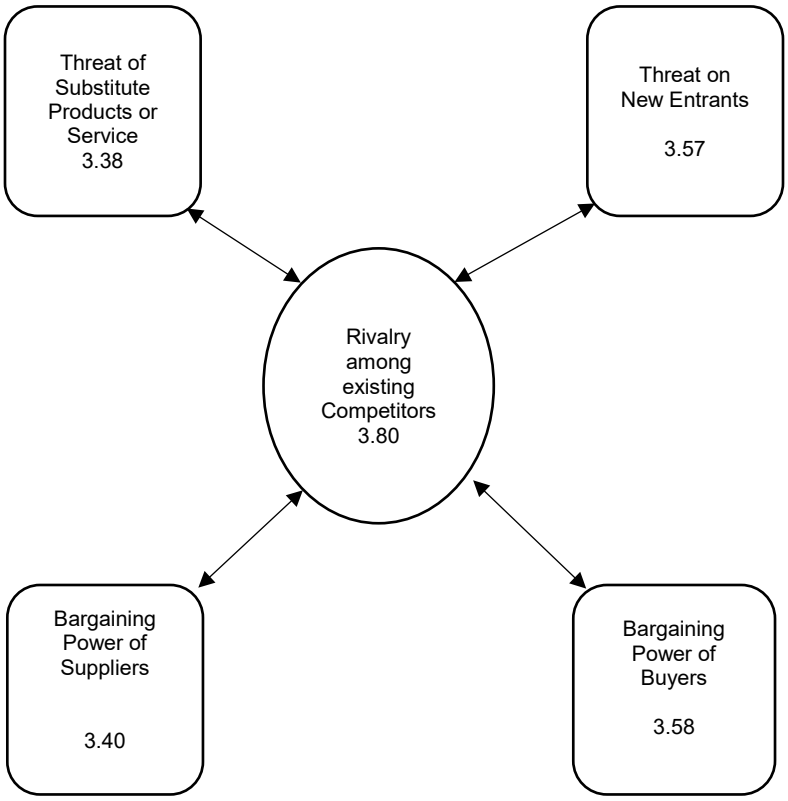

Figure 2 shows that companies view the sector's most competitive factor is "there is high competition among companies in the sector" (3.80), followed by the "negotiating power of customers" (3.58) and the possibility of new businesses (3.57). The competitive factor less valued by SMEs in the retail sector refers to the "ease of creating substitutes for products offered in the sector" (3.38) and the bargaining power of suppliers" (3.40).

Table 6: Perception of Business Results of SMEs in the Retail Sector

Axos	Results	Media	Desv. Tip.	Error Standard	Variance
Internal Processes	Quality of service	4.51	0.683	0.035	0.467
	Internal operating process	4.09	0.903	0.047	0.815
	Organization of personnel tasks	4.09	0.874	0.045	0.765
Open System	Customer Satisfaction	4.33	0.746	0.039	0.556
	Rapid adaptation of market needs	4.16	0.818	0.042	0.669
	Image of the company and its services	4.22	0.821	0.043	0.674
Rational System	Participación en el mercado	4.18	0.850	0.044	0.723
	Cost effectiveness	4.24	0.801	0.042	0.642
	Productivity	4.25	0.787	0.041	0.619
Human Means	Motivation of workers	3.96	0.928	0.048	0.861
	Satisfaction of workers	3.97	0.940	0.049	0.883
	Permanence of staff	3.83	1.174	0.061	1.379
	Assistance of punctuality of staff	3.90	1.048	0.054	1.099

The perception of participants regarding their business performance compared to competitors ranges from regular (3) to good (4). "Quality of service", "customer satisfaction", "profitability" and "productivity" have higher values. Those with less weight are: "staff retention", "attendance and punctuality", "motivation" and "worker satisfaction".

The model of Quinn and Rohrbaugh (1983) is used by FAEDPYME (Foundation for the Strategic Analysis and Development of SMEs in Latin America). FAEDPYME is a consortium of 80 universities to investigate the influence of business leadership, strategy, and competitive success. Studies of great depth and scope in Columbia, Spain, Mexico, Panama and Latin America confirm the acceptance of the results presented here.

Analysis by Means of Variables

We are interested in identifying any association between the level of development of managerial competencies with the stage of maturity, use of internal controls, gender of director or general manager and performance business. We use a Chi square test for this purpose with a level of significance of 95%.

H1-the Level of Development of Managerial Skills is Associated with the Stage of Maturity of the SME

We consider the growth, development and consolidation states of maturity. The FAEDPYME report Colombia (2012), taking into account the age of the company (Young: less than or equal to 10 years of creation), show finding contrary to that presented according to the size of the company. We observed that 50% of the evaluated variables have significant differences. These variables are: it has more efficient internal processes (young people: 3.8) and it has more satisfied clients (mature: 3.9). Other variables do not present significant differences. This implies that self-perception in the face of competition is not determined by the age of the MSME.

Table 7: Management Skills and the Stage of Maturity of SMEs

Competition Directive Generic	Results	Chi Square	Gl	S.I.G. Asisntot
Communication	Listen out	12.650	8	0.0243
	Reports	20.039	8	0.022**
	Drafting	18.447	8	0.219
	Information Search	22.719	8	0.008***
With the People	Conflicts	14.129	8	0.155
	Personal relationships	6.137	8	0.636
	Teamwork	11.536	8	0.198
	Customer service	9.030	8	0.390
Administration	Tracing	16.808	8	0.131
	Resource Effectiveness	11.060	8	0.211
	Organization	15.613	8	0.085*
	Planning	18.444	8	0.022**
Leadership	People Development	18.416	8	0.066*
	Delegation	8.856	8	0.413
	Control	13.876	8	0.162
	Motivation	11.770	8	0.263
	Leadership Style	17.157	8	0.033
	Leadership Impact	9.285	8	0.324
	Coaching	7.205	8	0.546

Level of Significance 0.01 ***0.05 **0.1*

This table specifies a value of significance with α = 10%. The remaining values are >0.10. Therefore, H1 is not generally accepted. There is a relationship with significant values in "information search, reporting, planning, organization, and development of people". Table 7 confirms that maturity stage and managerial competences do not have significant relation to most of the variables. Stages of maturity of SME considered are: growth, development, and consolidation.

H2- the Level of Development of Managerial Competencies is Associated with the Use of Internal Controls of the SME

Next, we consider internal controls (Table 8). Specifically, we consider: quality in service, cash flow, budgetary, control, economic and financial analysis, internal audit, and quality systems.

The FAEDPYME Colombia report (2012) states that in a competitive environment, it is essential that companies use all instruments related to information management that are within their reach. Accounting generates information on the aggregation of expenses and costs, as well as the economic and financial position of the firm through the analysis of the financial statements. The access and use of different forms of financing can limit the competitiveness of the company. For this reason, it is essential that companies use economic-accounting techniques, such as cash flow, internal audit, cost accounting, annual budgeting, and economic and financial analysis.

Table 8: The Level of Development of Managerial Competencies and the Use of Internal Control

Directive Competences				**Asymptotic Signalization**			
Generics	**Specifications**	**Generics**	**Specifications**	**Generics**	**Specifications**	**Generics**	**Specifications**
Communication	Listen out	0.020**	0.011**	0.012**	0.019**	0.003***	0.008***
	Reports	0.036**	0.011**	0.000***	0.000***	0.000***	0.000***
	Drafting	0.129	0.006***	0.001***	0.000***	0.018**	0.003***
	Search Information	0.032**	0.002***	0.013**	0.000***	0.000***	0.000***
With the People	Conflicts	0.000***	0.000***	0.023**	0.010**	0.011**	0.002***
	Personal relationships	0.001***	0.000***	0.002***	0.028**	0.008***	0.002***
	Teamwork	0.000***	0.000***	0.000***	0.000***	0.001***	0.000***
	Customer Service	0.000***	0.018**	0.006***	0.005***	0.116	0.000***
Administration	Tracing	0.000***	0.000***	0.000***	0.002***	0.001***	0.001***
	Resource Effectiveness	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	Organization	0.085*	0.000***	0.000***	0.002***	0.018**	0.003***
Leadership	Planning	0.000***	0.000***	0.000***	0.000***	0.012**	0.000***
	People Development	0.001***	0.000***	0.000***	0.002***	0.005***	0.014**
	Delegation	0.003***	0.000***	0.000***	0.009***	0.200	0.083*
	Control	0.000***	0.000***	0.000***	0.000***	0.062*	0.001***
	Motivation	0.000***	0.000***	0.000***	0.001***	0.013**	0.000***
	Leadership Style	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	Leadership Impact	0.000***	0.000***	0.000***	0.001***	0.000***	0.000***
	Coaching	0.000***	0.001***	0.000***	0.000***	0.002***	0.000***
Level of Significance 0.01 ***0.05 **0.1*							

*This table uses a value of significance with α = 10%. The remaining values are >0.10. * indicate a significant relationship between the level of managerial competencies and the use of internal controls of SMEs. We find significance in the 98% of the variables, so H2 is accepted. We infer there exists a relationship between the level of specific managerial competencies and the use of internal controls in "teamwork', "monitoring", "resource effectiveness", leadership style, leadership impact and coaching. It follows that as SMEs require the use of internal controls, management needs to use those specific managerial competencies in controlling their business performance.*

H3-the Level of Leadership Development Is Related to the Subject's Gender

Next, we consider the gender of the director or general manager. Independent of the gender of the director or general manager, it is necessary to strengthen managerial. Perception in self-evaluation, by gender, of the managers and directors is valued with a scale that ranges from 4.14 to 2.64 for males and 4.06 and 3.17 for females. Table 9 and Table 10 show that the level of managerial competencies is average for both genders, with the four highest specific managerial competencies for the males being: customer service, organization, conflict management and control. Less valued skills are: coaching, reporting, and writing.

Table 9: Comparison of the Use of Internal Controls Saltillo-Colombia-Spain

Internal Controls	**Saltillo Coahuila**	**Colombia**	**Spain**
Quality of Service	4.23	4.10	2.81
Cash Flow	4.14		
Budget Control	4.04	4.00	2.96
Economic - financial analysis	3.75	4.10	3.04
Internal audit	3.55	4.20	2.51
Quality Systems	3.95	4.10	2.81

Table 9 shows a comparison of our data with FAEDPYME Columbia (2012) and FAEDPYME Spain 2012: Considering the studies of FAEDPYME Columbia and Spain (2012) we infer there are significant differences in means (Table 9) with Spain in each of the Internal Controls. However, when comparing with Colombia data the differences are significant in internal auditing and financial economic analysis. The weakness in the use of the Internal Controls is a competitive disadvantage that diminishes the efficiency in the SMEs.

Table 10: The Level of Development of Managerial Competences Is Related to the Gender of the Subject

Directive Competences		Media				Competition Place		Sig.
Generics	**Specifications**	**Women**	**Generic**	**Men**	**Generic**	**Women**	**Men**	Asisntot
Communication	Listen out	3.94	3.55	3.99	3.68	6	12	0.303
	Reports	3.17		3.41		19	18	0.108
	Drafting	3.45		3.55		18	17	0.348
	Search Information	3.65		3.77		17	16	0.538
With Th People	Conflicts	3.94	3.94	4.11	4.09	6	3	0.106
	Personal relationships	3.90		4.08		10	6	0.318
	Teamwork	3.89		4.02		12	10	0.465
	Customer Service	4.04		4.14		2	1	0.110
Administration	Tracing	4.02	3.94	4.09	4.05	3	5	0.626
	Resource Effectiveness	3.86		4.00		13	11	0.210
	Organization	3.99		4.14		4	1	0.180
	Planning	3.90		3.98		10	13	0.500
Leadership	People Development	3.78	3.90	3.92	3.82	15	14	0.323
	Delegation	3.93		4.07		8	7	0.674
	Control	3.98		4.11		5	3	0.204
	Motivation	4.06		4.04		1	8	0.392
	Leadership Style	3.91		4.04		9	8	0.226
	Leadership Impact	3.84		3.92		14	14	0.097
	Coaching	3.78		2.64		15	19	0.249
Level of Significance 0.01 ***0.05 **0.1*								

This table uses a value of significance with α= 10%. The remaining values show >0.10 indicating no relation between the level of managerial competencies and the gender of the SME subject in 100% of the variables. Thus, H3 is not accepted. Table 10 shows similarity in the specific competences that are better valued in women and men. The first five with higher performance are: customer service, follow-up, organization and control. Lowest performance scores are for reports, writing, and information search.

For females, the highest specific competences are: motivation, customer service, follow-up, and organization. The least valued are: reports, writing, and information search. Charlo (2012) in her study The directive woman in the great Spanish company: profile, competencies and styles of management" concludes that the characteristics that stands out in women are responsibility, followed by tenacity and perseverance, empathy towards subordinates and communicative skills. In men, however, the most outstanding feature is the ability to exercise command, followed by responsibility, tenacity, and perseverance and discipline. Therefore, men and women agree on the importance of responsibility, tenacity, and perseverance. However, while a man stands out for his need for command, the woman does so by dealing with his subordinates.

The Proposal of Profile of Managerial Competences of SMEs of Commerce

The main objective of defining a competency profile is to implement a new style of management in the company to effectively and integrally manage the human factor in the organization. Ernest and Young Consultores (1998), lists the following objectives: A.) Improving and simplifying the integrated management of human resources; B.) The generation of process of continuous improvement in the quality and allocation of human resources; C.) The matching of the human resources management with the strategic lines of business; D.) The linkage of the manager in the management of his human resources; E.) Contribution to the professional development of individuals and the organization in a changing environment, and F.) Decision-making objectively and with homogenous criteria.

Alles (2004) clearly defines the general characteristics in the successful implementation of a competency-based human resource management system as: A.) The system is applicable and not theoretical; B. Understandable by all members of the organization; C.) Useful for the company; D.) Reliable; E.) Easy to use, and F.) That as a whole allows the professional development of people.

The most complex features of a position are competencies according to Spenser and Spenser (1993) and their Iceberg Model explains that knowledge, skills, and abilities are more on the surface and are easier to detect, but attitudes and values, the concept of oneself and the deeper personality traits, are below the surface and are more difficult to assess.

Profile of Directive Competencies and Their Degrees: The word profile according to the dictionary of the Real Academia Española defines in Geometry represents a body cut real or imaginary by a vertical plane. In painting an apparent contour of the figure, represented by lines that determine the shape of the form and conduct as the considerations in the conduct or social deal. *Generic Competition* is the standard definition of the competition with aspects of communication with people, administration, and leadership. *Specific Skills* based on the proposed classification of competences are: Listening, writing of reports, reports, information search, conflict management, personal relations, teamwork, customer service, planning, effectiveness of resources, follow-up, people development, control, delegation, motivation, leadership style, leadership impact, and coaching.

Levels, Grades, and Associated Behaviors: A tiered competency scheme was applied, in which three grades have been differentiated for each competency: Grade A: High, superior performance, Grade B: Optimal, above standard and Grade C: Minimum required for the position, but within the required profile. *Management Competencies by degrees:* allow the respondent to be placed in specific behaviors for further evaluation. From each generic competency the specifics by degree are described.

Evaluation of Analysis and the Staff Competences

The reflection of this section points to the conceptual meaning of Performance Evaluation. Chiavenato (1994) argues performance evaluation is a systematic assessment of the performance of each person in the position or potential future development. Any evaluation is a process to stimulate or judge the value, the excellence, the qualities of some person. The evaluation of individuals can be carried out using several approaches. Hartle (1993) notes that: Performance Evaluation must be conceived as a process or set of processes that seek to establish a shared knowledge about what is to be achieved and how it will be achieved with the participation of the management that increases the chances that it can be achieved.

Table 11: Description of Performance Levels

Performance Level	Description
Excellent	Outstanding in performance of the directive competition and maintains its effectiveness. Obtains extraordinary achievements against others in action and responsibility.
Domain	Regularly exceeds expected achievements. It is above average but needs to develop more in its directive competition
Regular	What you expect in this competition. Tulfilling the main demands of the position. Professional and efficient with training, experience, and knowledge.
Low	Below average in directive competition. Reflects performance that does not fully meet the requirements of the position. Needs improvement and development of Competencies.
Poor	Below the requirements of his position and his performance in terms of quality, quantity, and achievements.

This table describes the levels of performance of Directive Competencies used in our research. Determining the level of action with respect to generic and specific Competences is of utmost importance. Establishing the terminology will facilitate the application of the instrument designed. The performance levels shown are the starting point for assessing the observable behavior of managers. Source: The authors

Validation of the Competences Directives

This section points to the conceptual meaning of Performance Evaluation. McGregor (1994) reiterates that most people need and want feedback regarding their performance. This allows development of a plan to correct any deficiencies that the evaluation has discovered and allow them to reinforce things the

subordinate does correctly. Finally, evaluation can and should be central to the career planning process in the company. It provides a good opportunity to review the person's career plans in the light of their demonstrated strengths and weaknesses. Each level is valued by the evaluated and the evaluators who will give the result of performance. For each specific competition, 3 affirmations are used that value behavior performance: A.) The average of the evaluation 360/180 degrees will be determined. B.) A maximum and minimum of performance is determined by directive competence and C.) The difference between the result of the valuation and the corresponding maximum is the area of development that shows the gap of the Specific Directive Competition

Implementation of the Competency Profile and its Evaluation

Figure 3 shows the final proposal of a design of Directive Competences and its Evaluation according to a process that will allow a dynamic and flexible profile. Performance grades enable users to find three SME performance scenarios for partners, managers and supervisors. Describing observable behaviors is the starting point. Behaviors are valued from 360 or 180 degrees. The process involves affirmations with a Likert scale to obtain a diagnosis (personal, departmental, branch, business unit and hierarchical level). This allows validating and applying the design of managerial skills and its evaluation.

Figure 3: Proposal for the Design of Managerial Competences and Their Evaluation of SMEs

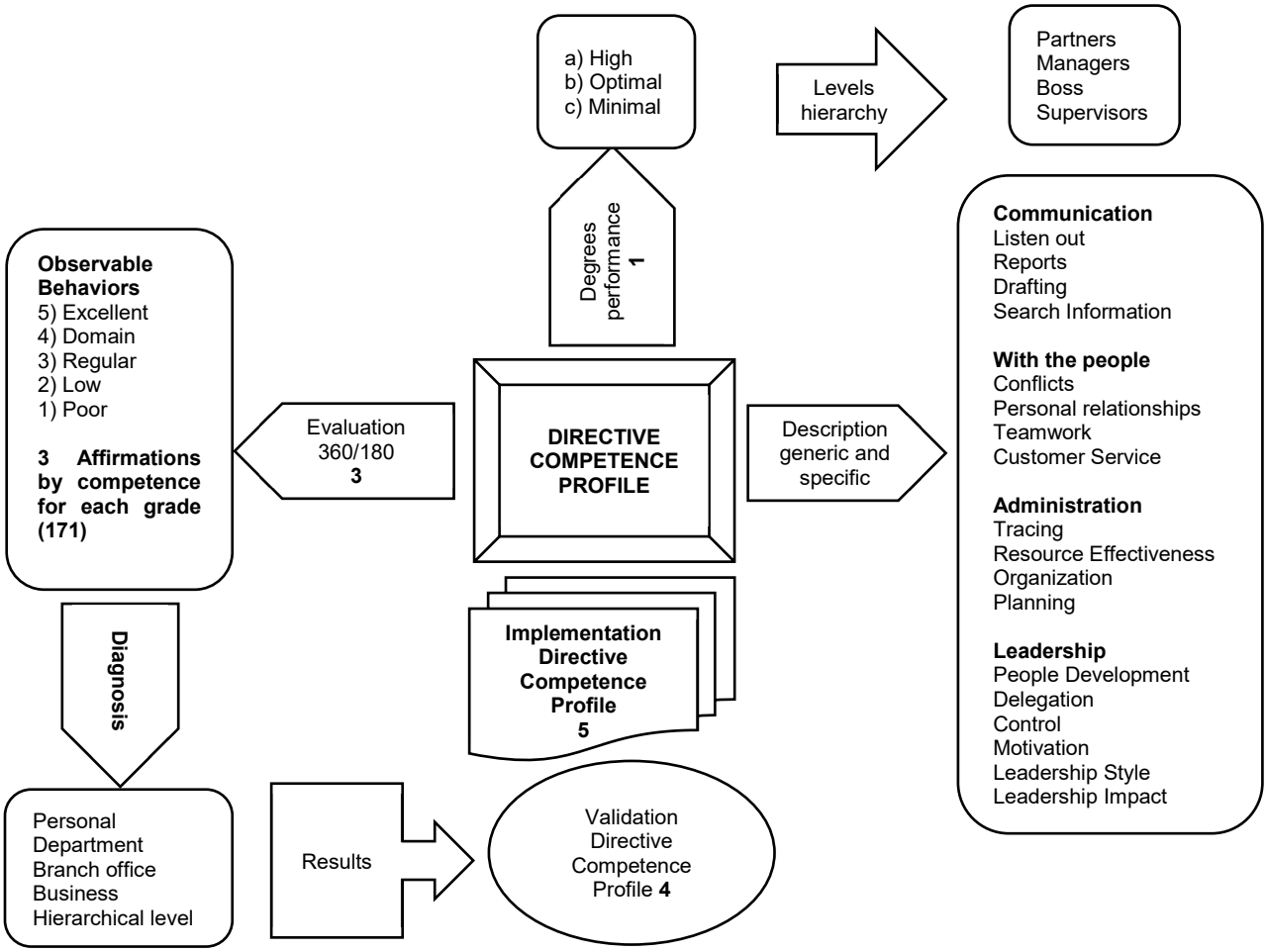

Figure 3 shows the design of managerial competences and its evaluation for SMEs in five stages. This model allows for the selection of performance levels to describe specific and generic managerial competencies, evaluate observable behaviors and obtain a personal, departmental, branched, company or hierarchical level to finally validate and implement the profile of managerial competencies. Source: the authors

Intervention Methodology for the Implementation of the Competency Profile for SMEs

The proposal to the managers of the intervention is to implement the profile design of managerial competencies in Step 1 of the proposed methodology (Figure 4). This seeks to identify the most valuable intangible asset to be identified with specific competences by locating its actual performance and future growth. The partner or manager will establish bases in the format designed for the beginning of the methodology, selecting the specific Competences Directives (Step 2).

Hamel and Orahalad (1995) recognize "in any case, in order to manage the stock of essential competencies of a company, senior executives must be able to disaggregate essential competencies into their components, to specific individuals with a talent specific". Hamal and Prahalad (1995) affirm that one has to imagine the future, but also to construct it. They note the need for more than annual or incremental planning is recognized, and a strategic architecture is required, to provide a blueprint for building competencies needed to dominate future markets. Selecting and identifying specific directives (Step 2) is the first line in the design of a strategic architecture for SMEs.

A level of competency scheme is applied in which three grades are differentiated for each competency (Step 3): Grade A: High, superior performance; Grade B: Optimal, above standard; Grade C: Minimum required for the position, but within the required profile.

Figure 4: Intervention Methodology for the Implementation of the Profile of Managerial Competences for SMEs

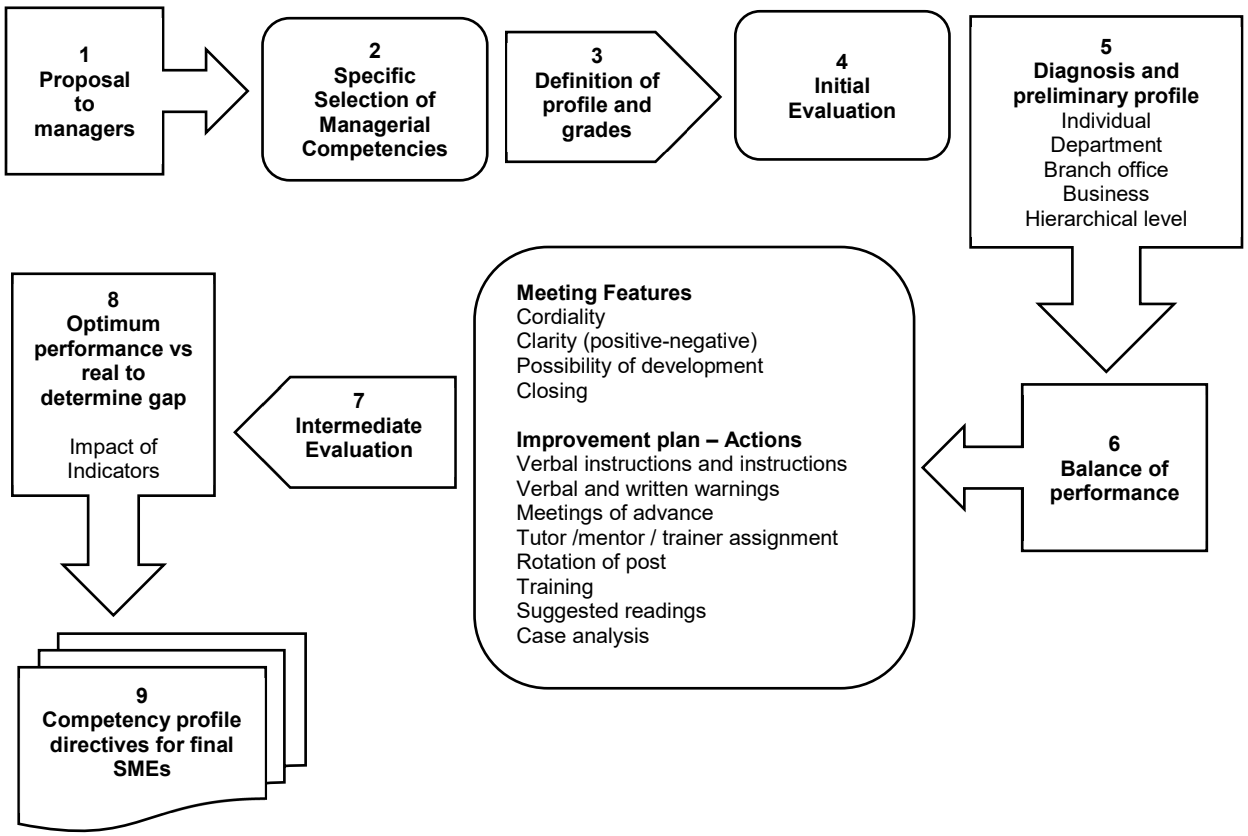

Figure 4 shows the intervention methodology for implementation of the profile of managerial competences for SMEs. The origin is the proposal to management. The company selects specific competences necessary, with their degrees, for an initial evaluation. This allows diagnosis and determination of an initial profile. The evaluated manager must know his performance balance with an improvement plan in his specific competencies. A midterm evaluation is then applied to determine the performance gap. Improvement of the competences impacts the business indicators. Source: the authors.

The degrees we established in our research are: Grade A: High, superior performance, Grade B: Optimal, above standard. Grade C: Minimum required for the position, but within the required profile

For the initial assessment of competences (Step 4), three characteristics must be considered: (Cardona and Garcia, 2009). A.) Relevance- Measure what you want to measure, B.) Reliability- Which responds to reality and is testable, C,) Standardization- Making it possible to compare them (between individuals and temporarily for each individual).

The proposal of 19 managerial competences, as shown in Figure 1, to be evaluated in our model is specifically established as being relevant in our trade subsector. When applying the approach we can confirm that they are specific directives with different intensities (contrastable) that impact successful SME management. We standardize them to observe the changes in performance between individuals and in general.

Describing Management Competencies by degrees is the diagnosis of General and Specific Directives Competences based on performance. Evaluation 360 is the instrument integrates several opinions that allow the analysis of performance through personal charts, departmental, branches, hierarchical levels and total organization. The result will provide a starting point for a future development plan of Competencies. In the case of SMEs with reduced staff, the 180-degree evaluation can be applied. This derivation is particularly useful for organizations with small staffs. Firms might graduate to from 180-degree to 360-degree evaluation.

When applying the initial evaluation, we obtain the diagnosis and preliminary profile. Step 5 describes the diagnosis and preliminary profile. Progress meetings (Step 6) suggested by Alles (2005) are key to the success of the performance assessment interviews. Alles (2005) provides an analytical guide to the characteristics of improvement meetings. The intermediate evaluation (Step 7) determines the gap covered in the implementation and evaluation process according to Romero (2008 p.6). Step 7 determines the optimal performance and compares it against actual performance. Step 8 establishes a tailored, dynamic and flexible profile utilizing characteristics noted by Cardona and Garcia (2009). Finally, to finish Step 8, the impact of indicators is determined according to Quinn and Rohrbaugh (1983). This process defines the definitive Profile of Directive Competences of the SME.

CONCLUSIONS

The research provides a model of managerial skills and its implementation for SMEs in the retail trade sector, in Saltillo Coahuila. The research was exploratory, descriptive, and propositional. Stratified probabilistic sampling was applied, with a confidence level of 95%. At total of 371 surveys were applied to partners, managers and supervisors in the retail trade sector. The self-assessment of managerial competencies establishes that motivation, customer service, organization and control are highly valued competencies. Specific managerial competences with the lowest evaluation are: reports, report search and coaching, and generic communication skills. Retail sector SMEs require partners and managers to perform their management with knowledge and motivational behaviors, customer service, and organize activities with monitoring, conflict resolution and measure results through control. Leadership of managers and partners is based on personal relationships, delegation and teamwork.

The competitive environment shows high competition among companies, where customers are key because of their bargaining power. The least valued competitive factor is the bargaining power of suppliers. The competitive environment is confirmed at an average level by the results obtained with values from 2.68 to 3.95.

Business performance in the retail trade sector is perceived to meet the forces of competition with quality service, customer satisfaction, profitability and productivity. The variables with greatest weakness are: staff retention, attendance, punctuality, motivation, and worker satisfaction. We infer that problems in the retail trade sector are: stability, high turnover, satisfaction, and motivation of the personnel. A strong association was found between managerial competencies and the use of internal controls (98%), confirming that managers and owners with greater managerial competence use more internal controls for the management and operation.

The result of the literature review led to the design of a proposal for Directives Competences and its implementation methodology. Owners and managers require innovative proposals to manage and operate SMEs as more business development and performance of management competencies are achieved.

An implementation methodology is established with its own design that provides a non-theoretical, easy-to-understand application methodology. This methodology is useful to SMEs because it is easy to handle and promotes the development of specific Directives. The methodology is selected by the Director or partner, which is important because of the growing role that this sector has had in the last twenty years. The classification of nineteen specific Directives provides a starting point for the management and development of the human factors in SMEs.

This research updates theoretical references and meaningful data for stakeholders. There are many related topics available for future research. These topics include: A.) Implementing a cases study of the proposals develop here, B.) Recognizing new management profiles by management competencies and their evaluation, and C.) Development of talent in the manager from the evaluation of competences.

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BIOGRAPHY

Melchor David Elizondo Sandoval, Mexican. Bachelor of Business Administration. Master in Administration from the Autonomous University of Nuevo León. Doctor in Administration and Senior Management from the Autonomous University of Coahuila. Professor of research at the Faculty of Administration Sciences. Business Criterio Empresarial S.C. Institutional address: FCA-UAdeC, Saltillo Unit. Km. 5 Carretera Saltillo - Piedras Negras. CP: 25107. Saltillo, Coahuila, México.

Jesús Alberto Montalvo Morales, Mexican. Bachelor of Business Administration. Master in Administration and Finance. Doctor in Administration and Senior Management from the Autonomous University of Coahuila (UAdeC). Professor, Researcher, Faculty of Administration Sciences. Currently Director of the Faculty of Administration Sciences, Saltillo, UAdeC. Institutional address: FCA-UAdeC, Saltillo Unit. Km. 5 Carretera Saltillo - Piedras Negras. 308. CP: 25107. Saltillo, Coahuila, México.

José Luis Pérez Cardona, Mexican. Bachelor of Accounting. Master in Taxes, Master in Finance and Doctor Candidate in Administration and Senior Management from the Autonomous University of Coahuila. Professor of research at the Faculty of Administration Sciences. Consultant in Family Business Heritage in Pérez Arzate y Asociados SC. Institutional address: FCA-UAdeC, Saltillo Unit. Km. 5 Carretera Saltillo - Piedras Negras. CP: 25107. Saltillo, Coahuila, México.

Jose Andres Muñoz, American. Student at Texas A&M University currently studying Civil Engineering. Institutional Address: 400 Bizzell St, College Station, TX 77843.

Luis Daniel Muñoz, American. Student at Early College High School located in Mercedes, Tx. Institutional address: 837 S Ohio Ave, Mercedes, TX 78570.

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AN INVESTIGATION OF PERFORMANCE MANAGEMENT SYSTEM MATURITY LEVELS AND INFLUENCING FACTORS: EVIDENCE FROM MOROCCAN SMES

Zineb Rahim, ENCG Business School, University Hassan 1st
Mohamed Lotfi, ENCG Business School, University Hassan 1st

ABSTRACT

Small and Medium Enterprises (SMEs) constitute a significant part of the Moroccan economy. Nowadays, Moroccan SMEs compete in a globalized, fierce and challenging environment. To face this challenge, it became essential and primordial for SMEs to optimize their business practices. One of the ways to do so is through "Performance Measurement". This paper investigates current performance measurement practices and their maturity level in Moroccan SMEs. The paper is directed towards understanding the drivers and barriers of performance measurement practices within the Moroccan SMEs context. Based on a review of the literature, a survey in Moroccan SMEs is conducted to describe the maturity level of Performance Measurement Systems (PMS) in Moroccan SMEs and to explain how some organizational contingency factors influence this maturity level. Results show a significant link between some considered-specific factors and PMS adoption.

JEL: M00

KEYWORDS*:* Moroccan SMEs, Contingency Theory, Maturity Level of Performance Measurement Systems (PMS), Classification Proposed by Paolo Cocca & Marco Alberti, Survey

INTRODUCTION

Various studies have examined the importance of performance measurement in the development of business management. The same studies have also shown that performance measurement helps organizations gain competitive advantages especially in a fierce and globalized environment (Garengo and Bititci, 2007). This is true for all companies regardless of size but is particularly true in Small and Medium Enterprises (SMEs). These companies compete in a globalized challenging environment. Moreover, they are vitally important for economic growth worldwide. In Morocco, for example, this category of enterprises accounts for more than 95 percent of all enterprises. They provide 50 percent of all private sector employment and generate 30 percent of the region's direct exports. It has become essential and primordial for these companies to optimize their business practices to preserve their competitiveness. Given the increasing emphasis on performance measurement and its importance for SMEs in supporting their managerial growth, we conduct a survey on performance measurement practices in the specific context of Moroccan SMEs. Various researchers have focused on the design of balanced Performance Measurement Systems (PMS) particularly intended for these companies. But most of these studies focused on theoretical issues. There is a lack of empirical investigation in the field of performance measurement and management in the specific context of SMEs, and even less in SMEs belonging to a developing country like Morocco.

The specific purpose of this paper is twofold. First, using a sample of 50 Moroccan SMEs' executives, the first purpose of our study is to investigate the extent of utilization, and the current practices on key aspects of performance measurement. Specifically, this research focuses on current practices related to the use of financial and non-financial measures, the form of data collection and storage, the frequency of performance measurement, the communication of performance results, the use of performance measures and the quality of performance measurement processes. These dimensions allow us to classify Moroccan SMEs into three maturity stages (Basic, Advanced, Excellent) according to the classification of PMS maturity levels proposed by Paolo Cocca and Marco Alberti in 2010. This first main objective helps us explore the SMEs' distribution among the three different maturity levels. This will help us evaluate the current situation of Moroccan SMEs and investigate the need for more effective tools and procedures to support SMEs during their PMS development process.

The second objective of our study is to explain this maturity level using contingency factors. Such an explanation should provide a better understanding of performance measurement practices as utilized in Moroccan SMEs. This will surely enhance our understanding of performance measurement practices within SMEs in general and Moroccan SMEs in particular.

Our study is survey based. The research instrument used to collect the data is the questionnaire. It was developed based on the literature. Several statistical analyses are utilized to accomplish the objective of our study. The remainder of this paper is organized into five main sections. First, a brief review of the literature is presented, and our conceptual model is described. The third section presents the research questions of the paper and develops our research hypotheses. Next, the research methodology is presented including the population and the method used to select our sample. The following section presents the main results and analysis of our survey. Finally, we conclude by presenting a discussion of our results as well as the limitations of our survey.

LITERATURE REVIEW

Various studies propose and analyze Performance Measurement Systems (PMS) models. The problem with these studies is that most do not consider company size. These studies tend to consider Small and Medium Enterprises (SMEs) as small big entities. SMEs should not be considered big entities but as entities that have their own characteristics and specificities. Besides, general frameworks to study PMS evolution are not suggested in the literature. To evaluate the current situation of Moroccan SMEs with regard to performance measurement practices and to analyze their PMS evolution and their PMS maturity level, it is necessary to study the following research question: What are the main dimensions that can best classify the maturity levels of PMSs in SMEs? To do this, a literature review is carried out.

A recent literature review by Paolo Cocca and Marco Alberti in 2010 was chosen because it considers specifically SMEs. The authors proposed a modified version of a maturity model for PMS proposed by T. Wettstein & P. Kueng (2002). Its advantage is that it takes into consideration the SMEs' specificities. This modified version of the framework consists of rearranging maturity levels into three instead of four groups. They are: Maturity Level 1, Maturity Level 2 and Maturity Level 3. Certain dimensions should be taken into consideration while classifying the maturity levels of the PMS used by SMEs. Paolo Cocca and Marco Alberti (2010) pointed out the presence of seven main dimensions that characterize contemporary PMS models to define the maturity level of PMS within the specific context of SMEs. These dimensions are: Scope of Measurement, Data Collection, Storage of Data, Communication of Performance Results, Use of Performance Measures, Quality of Performance Measurement Processes and Target Setting. The first six dimensions were included in the model proposed by Wettstein and Kueng (2002) and the "Targets setting" dimension was added. The dimensions included in the maturity model are the main dimensions that characterize contemporary PMS models mostly introduced after the mid-1980s.

These dimensions were adopted as the starting point of this research study. In fact, all the dimensions were used to explore the SMEs' distribution among the three maturity levels. This helps us to explore more effective tools and procedures to support SMEs during their PMS development process. Table 1 summarizes the different dimensions and the different maturity levels as proposed by Paolo Cocca and Marco Alberti (2002).

Table 1: Three-Stage Maturity Model for PMSS (Adapted from Wettstein and Kueng, 2002)

	Maturity Level 1	**Maturity Level 2**	**Maturity Level 3**
Scope of Measurement	Only financial performance indicators are considered.	Financial performance indicators are measured. In addition, a few nonfinancial	Both financial and non-financial performance indicators are measured in a balanced way.
Data Collection	Most performance-relevant data are collected manually.	Some performance data are collected manually and some by operational IT systems.	Collection of most performance data is fully automated by operational IT systems.
Storage of Data	Most performance data are stored in paper format.	Performance relevant data are stored in local PCs.	Most performance data are stored in a central database integrated with the IS.
Communication of Performance Results	Performance results are disseminated on an ad-hoc basis usually to upper and middle management.	Performance results are disseminated regularly and sometimes also to operative levels.	Performance results are disseminated regularly to all hierarchical levels and also to external stakeholders.
Use of Performance Measures	Performance data are used primarily for internal reporting.	Performance data are used primarily for checking improvements and analyzing deviations from targets.	Performance data are used primarily for supporting decision making.
Quality of Performance Measurement Processes	The measurement processes are not defined.	Measurement processes are documented and standardized for some main metrics. Frequency of measurement is regular.	Measurement processes are documented and standardized for all metrics. At least one person is responsible to collect and report the data
Target setting	No target levels are set for the metrics.	Target levels are set for some metrics.	Target levels are set for all metrics.

Table 1 shows the three-stage Maturity Model for performance measurement systems that was proposed by Paolo Cocca and Marco Alberti (2010). It was adapted from the model proposed by Wettstein and Kueng, 2002. There are three different maturity levels defined based on how the SME operates each of the seven dimensions identified within the framework (Scope of measurement, Data collection, Storage of data, Communication of performance results, use of performance measures, quality of performance measurement processes and Target setting).

Various internal factors are identified in the literature as affecting the scope and content of PMS. This paper uses contingency theory as our theoretical framework for investigating factors influencing performance measurement practices within Moroccan SMEs. For example, human capital is a contingency factor that has been positively linked to advanced performance measurement practices. Human skills and training were noted as one of the most important factors leading to advanced PMS (Kaplan & Norton (1996), Richardson (2004), Tung & al. (2011)).

Information technology is another contingency factor as the relationship between IT and PMS maturity levels has not been extensively studied in Moroccan SMEs. The literature points out that technology use is a key factor in performance measurement (Garengo & al (2005), Mendibil & MacBryde (2006)). Moreover, a firm's organizational strategy is also like to shape the design of PMS (Gordon and Narayanan, 1984; Chenhall, 2003; Franco-Santos and Bourne, 2005; Hussain and Hoque, 2002). Other important factors include organizational culture (Chenhall, 2003) and management style (Bititci et al., 2006), ISO 14000) (Rejc, 2004). These factors are said to influence the adoption and use of PMS and management control systems in general. This paper investigates these five contingency factors. These factors and their relationship to PMS maturity level have been proposed repeatedly in the literature. However, no study has analyzed the relationship between these factors and the maturity level of PMS in Moroccan SMEs. Therefore, our study fills this gap in the literature by examining the link between these organizational contingency factors and the adoption of PMS within Moroccan SMEs. Based on this literature review, the conceptual model is presented in Figure 1.

Figure 1: Conceptual Model for Investigating the Maturity Level of PMS and Influencing Factors in Moroccan SMEs

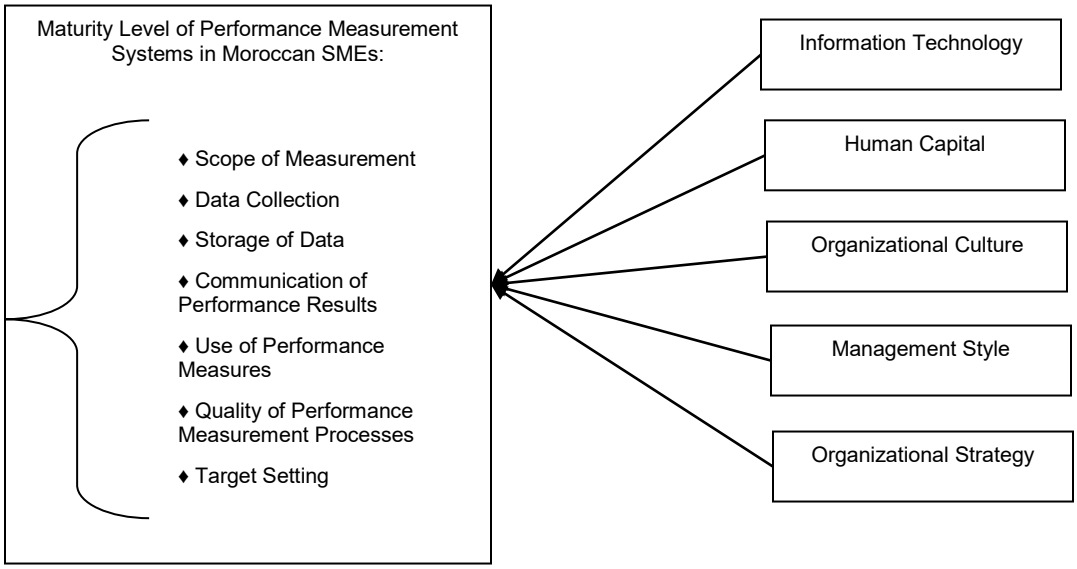


Figure1 shows our conceptual model which is based on both the three-stage Maturity Model for PMSs presented above and contingency theory. The maturity level of PMS in Moroccan SMEs is determined based on how the SME operates each of the seven dimensions identified within the framework (Scope of measurement, Data collection, Storage of data, Communication of performance results, use of performance measures, quality of performance measurement processes and Target setting). This maturity level is explained by five organizational contingency variables: (Information Technology, Human Capital, Organizational culture, Management style and organizational strategy).

DATA AND METHODOLOGY

The objectives of our study are twofold as stated above. Our paper investigates performance measurement practices among Moroccan Small and Medium Enterprises (SMEs). This helps us categorize them into three main levels of performance measurement systems (PMS) maturity stages. Our paper also identifies factors influencing performance measurement practices in the same context. Thus, the two main research questions that our paper aims to answer can be presented as follow:

> *Research Question No. 1: What is the maturity level of PMS in Moroccan SMEs?*
> *Research Question No. 2: What factors influence performance measurement practices within Moroccan SMEs?*

To answer our research questions, the conceptual framework described in Figure 1 is used to develop our research hypotheses. Furthermore, another hypothesis related to the PMS maturity level is added. SMEs in general, and Moroccan SMEs in particular, have some characteristics in common. They suffer from very limited financial and human resources. They also tend to adopt some informal strategies and a certain management style. This leads us to say that SMEs could still have a basic PMS maturity level as they don't have enough resources and skills to develop advanced or excellent performance measurement practices. Thus, the hypotheses could be formulated as shown in Table 2.

The population investigated consisted of Moroccan SMEs. However, the first problem the authors faced was definitions to adopt for the survey. In fact, defining SMEs, in general, and Moroccan SMEs in particular, is ambiguous as there exist various definitions. Nevertheless, we opted for the most recent definition of Moroccan SMEs in our research. We use the definition proposed by the General Confederation of Moroccan Companies. It defines a small company as a company that has a turnover

between 3 and 10 millions of Dirhams. It defines a medium company as a company that has a turnover between 10 and 175 millions of Dirhams. The authors decided to focus the research on Moroccan SMEs located in the region Casablanca – Settat. This region is located in the central-western part of Morocco. Most Moroccan SMEs are located in this region and it could be representative of most Moroccan SMEs. However, we exclude the service sector to have a holistic and a complete view. Service SMEs were excluded from our survey because literature and practices have shown that their approach to performance measurement and use is very different relative to other business sectors (Fitzgerald et al. 1991).

Table 2: The Research Hypotheses Development

Number of Hypothesis	Hypothesis Development
Hypothesis number 1	Most of the Moroccan SMEs still have a basic maturity level of their PMS
Hypothesis number 2	Advanced information management practice is positively associated with the presence of a balanced PMS in Moroccan SMEs
Hypothesis number 3	Advanced human capital competence is positively associated with the presence of a balanced PMS in Moroccan SMEs
Hypothesis number 4	A participative management style is positively associated with the presence of a balanced PMS in Moroccan SMEs
Hypothesis number 5	A collaborative organizational culture is positively associated with the presence of a balanced PMS in Moroccan SMEs
Hypothesis number6	Clear organizational strategy is positively associated with the presence of a balanced PMS in Moroccan SMEs

Table 2 shows our six research hypotheses. The first hypothesis answers our first research question on the maturity level of performance measurement systems within Moroccan SMEs. The five other hypotheses are related to our second research question which considers the drivers of PMS adoption within Moroccan SMEs.

After designing the survey questions, data collection was carried out from a randomly selected group of Moroccan SMEs as defined by the General Confederation of Moroccan Companies as presented above. The survey ran from July 2017 to January 2018 and targeted managers-owners of Moroccan SMEs because performance measurement is generally operated at the top management level. The authors promised to share a summary of the findings with the SMEs involved in the survey to encourage them to participate. The first way used to conduct our survey was mailing. It allowed us to collect 23 questionnaires out of 200 companies, an initial response rate of 11 percent. The second approach was e-mailing which allowed us to collect 82 questionnaires out of 1,200 companies, for an initial response rate of almost 7 percent. Finally, contacting 46 SMEs for in person interviews allowed us to collect data from 13 additional firms, a response rate of 28 percent. Table 3 summarizes the response rates of the survey.

Table 3: Response Rate of Our Survey

Ways of Conducting the Survey	Number of Questionnaires Sent	Number of Questionnaires Received	Percentage of Responses
Mailing	200	23	11percent
Electronic Mailing	1200	82	7 percent
In person interviews	46	13	28percent
Total	1446	118	8percent

Table 3 shows the survey response rate. Three methods were used to conduct our survey. It included mailing, electronic mailing and in person interviews. Out of the 1,446 questionnaires sent, we only received 118 responses.

Out of the various respondents invited to participate in our survey, the only exploitable questionnaires available were 50 SMEs out of the 118 received. In fact, only 50 SMEs met our definition. Thus, we considered a total of 50 SMEs for our analyses. SPSS package v11.0 was used to analyze the data. The questionnaire consisted of three main sections: 1.) The company background 2.) The maturity level of the PMS and the performance measurement practices 3.) Barriers and drivers to PMS adoption. The first section of the questionnaire was intended to determine general information about the SME. It provided a snapshot of each respondent and the nature of their organization. It included the number of employees, the

annual turnover, sector of activity and the number of years of existence of the company. Its main objective was to give the authors a general idea on background and most importantly to confirm that the company was indeed an SME as defined before.

The second section consisted of 20 statements about the company's performance measurement practices. This section measures the firm's PMS maturity level. It looked at current practices in performance measurement. The analysis of responses allowed the authors to classify the levels of PMS adoption of respondent companies in relation to the performance measurement practices identified in the literature, specifically, the three-stage Maturity Model for PMSs. A fixed set of performance measurement dimensions were developed based on the literature review. The dimensions were: Scope of Measurement, Data Collection, Storage of Data, Communication of Performance Results, Use of Performance Measures, Quality of Performance Measurement Processes and Target Setting. Respondents were asked to rate their degree of agreement with each statement according to a five-point Likert scale from 1 "strongly disagree" to 5 "strongly agree". Table 4 presents statements' examples for some dimensions identified in the questionnaire.

Table 4: Examples of Questions from the Second Section of the Questionnaire

Dimensions Identified in Section 2 of the Questionnaire	**Examples of Questions Asked**
Scope of Measurement	Please indicate how extensively are the following measures used in evaluating your performance: Financial performance/ Competitiveness/ Customer satisfaction/ Resources utilization/ Innovation…
Use of performance measures	Please indicate how extensively are the following criteria used as a purpose for measuring performance: Internal reporting/ Checking improvements and analyzing deviations from targets/ Supporting decision making.
Quality of Performance Measurement Processes	Please indicate how extensively are the following characteristics best reflect the design of your performance measurement system: The measurement processes are not defined/ Measurement processes are documented and standardized for some main metrics; Frequency of measurement is regular/ Measurement processes are documented and standardized for all metrics. At least one person is responsible to collect and report the data.

This table shows some examples of the questions included in our questionnaire. These examples are related to the second section of our questionnaire entitled: The maturity level of PMS in Moroccan SMEs which is intended to answer our first research question. Three sample questions related to three dimensions (scope of measurement, use of performance measures and quality of performance measurement processes) out of seven are presented in this table.

As noted earlier, contingency theory was chosen as the theoretical basis for the third questionnaire section. The final section consisted of the five organizational factors found in the literature to act as drivers or barrier forces to performance measurement practices in SMEs. The same Likert scale used in the second section was used to rate the respondent's degree of agreement with each of the questions related to each variable. For that section, the five organizational factors chosen for investigation are: human resources, information technology, management style, organizational culture and organizational strategy. Each factor was further developed into statements according to the literature to investigate the influence of these factors on performance measurement practices in Moroccan SMEs. Thus, 60 statements were proposed to evaluate this influence. Table 5 presents an example of a statement for each contingency variable as it appears in the questionnaire.

After testing the questionnaire's validity, internal reliability was tested. An instrument has content validity if it contains a representative collection of items and if sensible methods of test construction were used (Yusof and Aspinwall, 2000b). The content validity was tested thanks to academics and company managers who assessed them. Thirdly, we tested the construct validity thanks to principal components analysis (PCA). In fact, according to Hair et al., 1998, testing construct validity implies that every measure within a component should have a significant correlation with variables of the same component and low correlation with others.

Table 5: Examples of Questions from the Third Section of the Questionnaire

Contingency Factors Identified in Section 3 of the Questionnaire	Examples of Question Asked
Human Resources	Please indicate the levels of working experience (various choices were given to respondents on the number of years of experience => Examples: less than 1 year to more than 15years) / Education level of your management team (various choices were given to respondents on the educational level of their management team => Examples: Primary education to Doctorate qualification)
Information Technology	Please indicate your degree of agreement with the following statements that are used to describe your company's usage and investment levels of information technology (Various choices were given to respondents on the use and investment levels of IT=> Examples: Our level of IT investment is sufficient).
Management style	Please indicate you degree of agreement with the following statements that best describe the management style of your company: Various choices were given to respondents on their management style => Examples: The management encourages all employees to develop their talents and abilities/ Jobs are clearly defined in the company…)
Organizational culture	Please indicate the extent each of these values is important to your company (Various choices were given to respondents on the values that are important for them: => Examples: Innovation, risk taking, team working…)
Organizational strategy	Please indicate the extent each of these characteristics is important to your company (Various choices were given to respondents on the strategies adopted => Examples: Costs, customer service, Brand identification…)

This table shows examples of questions included in our questionnaire. These examples are related to the third section of our questionnaire entitled: Drivers or barriers forces to performance measurement practices within Moroccan SMEs which is intended to answer our second research question. Some sample questions out of 60 statements are presented. Each is related to one of the five organizational contingency variables (human resources, information technology, management style, organizational culture and organizational strategy).

RESULTS AND DISCUSSION

Out of the 50 Small and Medium Enterprises (SMEs) who returned their questionnaires, 10 were small enterprises and 40 were Medium enterprises. We interviewed SMEs belonging to a variety of activity sectors. The majority of enterprises operate in the electronic sector followed by the building sector and the food industry. All our respondents were managers-owners of Moroccan SMEs because performance measurement is generally operated at the top management level.

Questions related to each dimension of PMS maturity levels were included in the questionnaire allowing a classification of interviewed SMEs among the three PMS maturity levels according to our theoretical framework. Results indicate: 1.) Most interviewed companies have a balanced PMS. Both financial and non-financial indicators are used to monitor performance. Most Moroccan CEOs are aware of the importance of measuring all types of indicators. Contrary to expectations, most interviewed Moroccan CEOs affirm that they measure both financial and some non-financial indicators. These measures include: financial indicators, indicators related to customers' satisfaction, indicators related to human capital and indicators related to target settings. However, indicators related to competitiveness were notably weak.

Ten percent of interviewed SMEs have excellent maturity level on scope of measurement. In most cases, data collection is automated by IT systems and data storage is centralized in more than 40 percent of interviewed SMEs. The dissemination of performance results is a regular process in all firms. In most cases, this involves upper and middle management. However, only 16 percent of interviewed SMEs include operative levels in the dissemination of performance results. Most interviewed companies agreed that reasons for implementing PMS vary. The goal is not simply internal reporting but also checking improvements, analyzing deviations and supporting decision making. The measurement process is formalized in terms of procedures definition and performance targets setting in more than 40 percent of firms. These conclusions are summarized in Table 6 showing the percentage of the interviewed SMEs for each dimension of the three maturity levels framework adapted from Wettstein and Kueng, 2002.

Table 6: PMS Maturity Level of the Different Moroccan SMEs Involved in our Survey

Dimensions	Basic	Advanced	Excellent
Scope of Measurement	10 percent	80 percent	10 percent
Data Collection	26 percent	30 percent	44 percent
Storage of Data	26 percent	30 percent	44 percent
Communication of Performance Results	20 percent	64 percent	16 percent
Use of Performance Measures	18 percent	36 percent	46 percent
Quality of Performance Measurement Processes	20 percent	36 percent	44 percent
Target setting	16 percent	50 percent	34 percent

This table shows the distribution of SMEs engaged in our survey in the different PMS maturity levels. It shows the frequency distribution of sample companies among the three different maturity stages. This is based on how the surveyed SMEs operate each of the seven dimensions identified within the framework (scope of measurement, data collection, storage of data, communication of performance results, use of performance measures, quality of performance measurement processes and target setting).

It is clear from Table 6 that Moroccan SMEs are moving towards more excellent performance measurement practices. This conclusion is based on how the surveyed SMEs operate each of the seven dimensions identified within the framework as mentioned in Table 6. Contrary to expectations, CEOs of Moroccan SMEs have become aware of the importance of PMS in managing their businesses to gain competitive advantages especially in the fierce and globalized environment where they are competing.

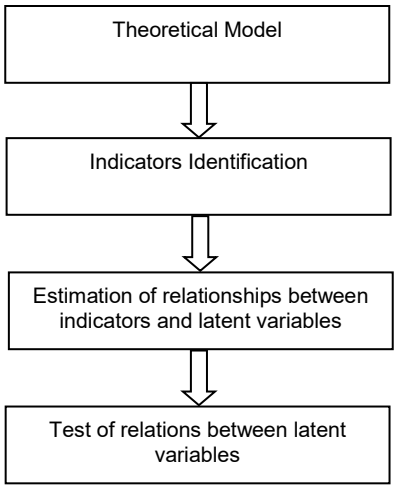
Now, it's important to understand the reasons preventing some Moroccan SMEs from moving to the next level of PMS. It is necessary to investigate factors influencing the adoption of advanced practices. This constitutes our second research question. We have chosen to study the impact of some contingency factors on the maturity level of PMS in the Moroccan context. Therefore, the conceptual model of research presented in Figure 1 presents the different causal links between these variables. To answer our second research question, structural equations models (SEMs) are used. SEMs are useful for representing multiple relationships among a set of variables.

Figure 2 summarizes the steps involved to answer our second research question using the structural equations models. We remind readers that our second research question is as follow: What are the factors that influence performance measurement practices within Moroccan SMEs?

To answer our second research question, we followed the stages identified in Figure 2. Our theoretical model was developed based on the literature review presented earlier. Secondly, we conducted an exploratory analysis. For that purpose, we utilized varimax rotation analysis and calculated the Cronbach Alpha coefficients for each dimension obtained. Furthermore, we conducted confirmatory analyzes. The Jöreskog Rhô was used to check reliability of the measurement model dimensions. Finally, the structural model presented in Figure 3 makes it possible to verify the research hypotheses. It presents the causal model as well as standardized coefficients estimated by the maximum likelihood method.

Figure 3 confirms the following relationships: 1.) Any variation of the manifest variable: Information technology of a unit implies a variation of the latent variable: maturity of the PMS by 86 percent. 2) Any variation in the manifest variable: Human capital of a unit implies a variation of the latent variable: maturity of the PMS by 66 percent. 3) Any variation in the manifest variable: Management style of a unit implies a variation of the latent variable: maturity of the PMS by 66 percent. 4) Any variation of the manifest variable: Organizational culture of a unit implies a variation of the latent variable: maturity of the PMS by 71 percent. 5) Any variation of the manifest variable: Organizational strategy of a unit implies a variation of the latent variable: maturity of the PMS by 70 percent.

Figure 2: Structural Equations Models Construction Stages According to Meschi & Livolsi, 2003



This figure shows the four steps to construct structural equations models according to Meschi & Livolsi, 2003. The first step includes constructing the theoretical model. It is followed by identifying the indicators. The third step involves the estimation of relationships between indicators and latent variables. The final step includes testing relations between latent variables.

To verify the quality of our structural model, we examined some fit indices. The quality of any structural model can be appreciated through the evaluation of fit indices. Each of these indices has a set of specific characteristics. Therefore, several indices that fall into three categories which are: absolute indices, incremental indices and parsimony indices. Absolute indices are qualified as classical indices (Chaput, 2006). These indices indicate the similarity or difference between the estimated model and the observed variance/covariance matrix (Roussel et al, 2002, Schumacker and Lomax, 2004). Included in this category are the Root-mean-square error of approximation (RMSEA), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI) and the Root-mean-square residual (RMR).

Figure 3: The Causal Model of Research

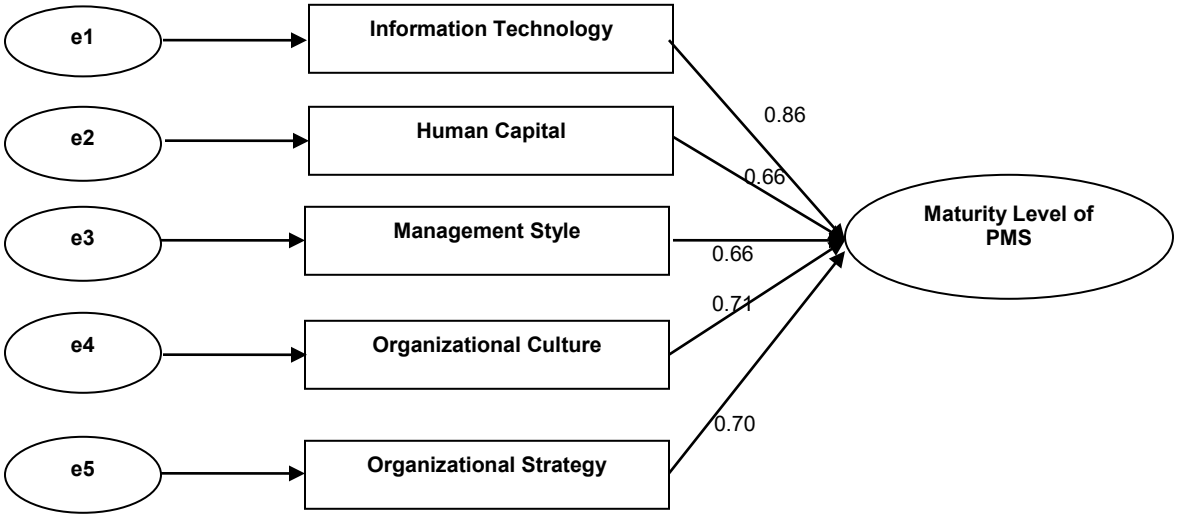


Figure 3 shows the structural model which makes it possible to verify our research hypotheses. It shows the causal model as well as values which are related to the standardized coefficients estimated by the maximum likelihood method (ML). The figure confirms the effect of variation of each manifest variable (Information technology, Human Capital, Management style, organizational culture and organizational strategy) on the variation of the latent variable (The maturity level of performance measurement systems)

Incremental indices are used to make it possible to compare the estimated model and the reference model having a zero correlation between the observed data (Roussel et al, 2002). Included in this category are the Normal Fit Index (NFI) and the Comparative Fit Index (CFI). Finally, parsimony indices control overestimation of the model. They determine the necessary number of parameters to estimate to achieve the specific adjustment level (Schumacker and Lomax, 2004). Table 7 presents examples of indices for each fit index used to verify the quality of any structural mode. The table takes into account the work of Roussel et al (2002), Evrard et al (2003), and Schumacker and Lomax (2004). For each of the indices mentioned, acceptable thresholds are presented. The indices should respect the levels of acceptance commonly accepted by researchers to have a good fit of the tested model.

Table 7: Fit Indices, Their Definitions and Their Acceptable Thresholds

Fit Indices Type	Characteristic	Examples and Descriptions	Acceptable Threshold Level
Absolute fit Indices	These indices make it possible to verify the similarity between the theoretical model and the observed data.	Goodness of Fit Index (GFI): a non-statistical index that measures the overall degree of model fit.	Values more than 0.9
		Adjusted Goodness of Fit Index (AGFI): differs from the GFI in terms of its adjustment for the number of degrees of freedom in the model (Byrne, 1998).	
		Root-mean-square residual (RMR) : is the square root of the average amount that the sample variances and covariances differ from their estimates	Values less than 0.05
		Root-mean-square error of approximation (RMSEA): The purpose of the RMSEA in an SEM study is to adjust the complexity of the model and sample size.	
Incremental fit indices	These indices make it possible to compare between the tested model and the reference model.	Normal Fit Index(NFI): represents a relative comparison between a proposed and the null model (Hair et al., 2010)	Values more than 0.9
		Comparative Fit Index (CFI) : Revised version the normed fit index proposed by Bentler (1990)	
		Relative Fit Index (RFI): This index takes the degrees of freedom for the two models into account.	
		Incremental fit Index (IFI): Describes the parsimony of the sample size in the estimated and null model.	
		Tucker-Lewis Coefficient (TLC): represents a measure of parsimony between the comparative index in the proposed and null models (Marsh and Hau, 1996; Hair et al., 2010).	
Parsimony fit indices	This index provides a simpler model with a better fit.	Chisq/DF: represents the ratio of the minimum discrepancy to degrees of freedom.	Values should be close to 1.0 for correct models.

This table shows the three categories of fit indices used to verify the quality of any structural model: The absolute, the incremental and the parsimony fit indices and their respective definitions. It also shows some examples of fit indices that fall under each category, their definitions as well as their acceptable threshold level.

Analysis of Moment Structures (AMOS) software was used for structural equation modeling (SEM). AMOS output includes results for three models. First, it shows the default model which we have designed. Second, it shows independence which reveals that each measured variable is correlated exactly with each other measured variable (with no latent constructs). Finally, it shows the saturated model, which uses the maximum available parameters and is guaranteed to provide a perfect fit. We report some important fit indices here that fall under each category presented in Table 7. To verify the quality of our structural model, Table 8 presents the results of the previous indices. To justify that our model shows a good fit, we calculated the indices presented above. The results indicate the structural model provides a good fit. For each of index presented, the values of our indices are measured. This table reports most goodness-of-fit measures found in the Model Fit Summary output of AMOS.

Table 8: Results of Our Fit Indices of Our Structural Model

	CMIN					RMR, GFI			
Model	**NPAR**	**CMIN**	**DF**	**P**	**CMIN/DF**	**RMR**	**GFI**	**AGFI**	**PGFI**
Default model	11	3.459	4	0.484	0.865	0.031	0.973	0.899	0.259
Saturated model	15	0.000	0			0.000	1.000		
Independence model	5	104.48	10	0.000	10.448	0.434	0.459	0.188	0.306
	Baseline Comparaisons					**RMSEA**			
Model	**NFI Delta1**	**RFI rho1**	**IFI Delta2**	**TLI rho2**	**CFI**	**RMSEA**	**LO 90**	**HI 90**	**PCLOSE**
Default model	0.967	0.917	1.005	1.014	1.000	0.000	0.000	0.202	0.546
Saturated model	1.000		1.000		1.000				
Independence model	0.000	0.000	0.000	0.000	0.000	0.439	0.365	0.517	0.000

Table 8 shows the results of our fit indices. For each index mentioned above, we present values related to our structural model in Figure 2. The Analysis of Moment Structures (AMOS) output has reported results for three models. First, it shows the default model which is: the model we designed. Second, it shows the independence model which reveals that each measured variable is correlated exactly with each other measured variable (with no latent constructs). Finally, it shows the saturated model, which uses the maximum available parameters and is guaranteed to provide a perfect fit. The CMIN is the minimum value of the discrepancy function between the sample covariance matrix and the estimated covariance matrix. RMR is the square root of the average amount that the sample variances and covariances differ from their estimates. GFI measures the overall degree of the model fit. Baseline comparisons present the values of the NFI and CFI. These latter represent relative comparisons between the proposed and the null model. The RMSEA column presents adjusts the complexity of the model and sample size.

Table 8 indicates the structural model has a good fit. It shows values of absolute, incremental and parsimony fit indices. The values of GFI and AGFI, that measure the overall degree as well as the adjustment for the number of degrees of the model fit, are greater than 0.9 and close to 1. The values of NFI and CFI, which represent relative comparisons between the proposed and the null model, are greater than 0.9. The RFI value is also greater than 0.9. This incremental fit index takes the degrees of freedom for two models into account. IFI and TLC values are also greater than 0.9 and close to 1. These two indices represent the parsimony of sample size in the estimated and null model as well as parsimony between the comparative index in the proposed and null models indices. The RMR, which is the square root of the average amount that the sample variances and covariances differ from their estimates as well as the RMSEA that adjusts the complexity of the model and sample size, are less than 0.1 and converge to 0. The Chisq/DF value, which represents the ratio of the minimum discrepancy to degrees of freedom, is close to 1. The values of these indices lead us to conclude the model specified in Figure 3 is a correct model. Table 9 recapitulates our research hypotheses, the test results and their validation.

All the analyzed contingency variables were found to have a statistically significant association with the adoption of a PMS by Moroccan SMEs. The presence of a balanced PMS in Moroccan SMEs is positively associated with the following elements. Moroccan SMEs need to adopt advanced information management practices and invest in advanced human capital competence. Furthermore, Moroccan SMEs need to adopt a participative management style and encourage a collaborative organizational culture. Finally, Moroccan SMEs need to have a clear organizational strategy. As far as the maturity level of PMS in Moroccan SMEs is considered, Moroccan SMEs are moving towards more excellent performance measurement practices. Indeed, contrary to expectations, Chief Executive Officers (CEOs) of Moroccan SMEs have become aware of the importance of PMS in managing their businesses to gain competitive advantages especially in the fierce and globalized environment where they compete.

Table 9: Our Research Hypotheses Results and Validation

Research Hypotheses	Test Results	Validation
Most of the Moroccan SMEs still have a basic maturity level of their PMS		*Rejected*
Advanced information management practice is positively associated with the presence of a balanced PMS in Moroccan SMEs	*Beta :0.86**** *Sig : 0.000****	*Accepted*
Advanced human capital competence is positively associated with the presence of a balanced PMS in Moroccan SMEs	*Beta :0.66**** *Sig : 0.000****	*Accepted*
A participative management style is positively associated with the presence of a balanced PMS in Moroccan SMEs	*Beta :0.66**** *Sig : 0,000****	*Accepted*
A collaborative organizational culture is positively associated with the presence of a balanced PMS in Moroccan SMEs	*Beta :0.71**** *Sig : 0.000****	*Accepted*
Clear organizational strategy is positively associated with the presence of a balanced PMS in Moroccan SMEs	*Beta :0.70**** *Sig : 0.000****	*Accepted*

*This table recapitulates our research hypotheses, the test results and the validation of our hypotheses. Five out of the six hypotheses tested have been substantiated. The contingency factors analyzed were found to have a statistically significant association with the adoption of a PMS by Moroccan SMEs. However only one hypotheses presented was rejected. It is related to our first research question associated with the maturity level of PMS in Moroccan SMEs. *, **, *** indicate significance at the 10, 5, and 1 percent levels respectively*

CONCLUDING COMMENTS

Our paper analyzed the results of a survey involving 50 Moroccan Small and Medium Enterprises (SMEs). Our empirical investigation gave an overview of the performance measurement practices in Moroccan SMEs. All dimensions stated in the framework proposed by Paolo Cocca and Marco Alberti (2010) were analyzed and allowed us to classify the interviewed companies into three maturity levels. According to our survey, Moroccan SMEs are moving towards more advanced PMS (Performance Measurement Systems). Most surveyed companies are middle level. However, some practices were notably weak. In particular, SMEs need to integrate the measurement of some non financial indicators like indicators related to competitiveness. Data collection needs to me more automated by IT systems in more Moroccan SMEs.

Our study allowed us to understand the contingency factors influencing the maturity level of PMS in Moroccan SMEs. We tested six theoretical propositions. All the contingency variables were found to have significant impact on the maturity level of PMS in Moroccan SMEs. Advanced Human capital competences and Information Technology practices were found to be drivers of PMS adoption in Moroccan SMEs. A participative management style and an organizational culture opened to innovation seem to favor the implementation and use of a PMS in Moroccan SMEs. These elements provide useful knowledge for the development of frameworks and tools specifically designed for effective use in SMEs. Our study has some limitations related to our sample size. Future research might include a larger sample to test the generalizability of the present findings.

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BIOGRAPHY

Ms. Rahim Zineb is a Ph.D Student in the Finance and Management control laboratory at ENCG Business School, University Hassan the 1st in Settat , Morocco.

Dr. Mohamed Lotfi is a Professor of Finance and Management Control at ENCG Business School, University Hassan the 1st in Settat, Morocco.

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EUROPEAN EVIDENCE ON THE DIGITAL ACHIEVEMENT INDEX

Ana Isabel Ordóñez Parada, Universidad Autónoma de Chihuahua
Carlos Cristian De la Rosa Flores, Universidad Autónoma de Chihuahua
Carmen Romelia Flores Morales, Universidad Autónoma de Chihuahua
Luis Raúl Sánchez Acosta, Universidad Autónoma de Chihuahua
Irma Leticia Chávez Márquez, Universidad Autónoma de Chihuahua

ABSTRACT

The incorporation of technology in all aspects of our lives has transformed the way of doing things, in form and substance. In recent years, the number of internet users has increased considerably both in Europe and in the rest of the world. It is necessary to acquire perspective to understand the phenomenon of access to digital technologies. This research examines technology use in 28 European Union countries, using a principal components methodology. Eighteen variables were examined, one for each objective that the population between 16 and 74 years old has when using the internet. The results indicate that countries using the most digital technology were Holland, Switzerland, Luxembourg, Finland, Denmark and Estonia. Countries with low utilization were Romania and Bulgaria.

JEL: C38, D83, L86

KEYWORDS*:* Digital Access, Digital Technologies, Main Components, European Union

INTRODUCTION

The objective of this work is to identify the use of digital technologies in 28 European Union countries. Martinez (2013) indicates in his study "Digital Skills and Gender Gap in Europe", that men and women have differences in the way they use technology. These differences are identified in both simple, frequently used activities and those whose use require greater knowledge and specialization. In most European countries there are differences in the way men and women use information. Differences between European countries in the management of technology and use of information are marked. For example, the people of the Netherlands and the Nordics have greater knowledge and skills with regard to technology and information management.

According to Castells (1997), "The term informative indicates the attribute of a specific form of social organization in which the generation, processing and transmission of information become the fundamental sources of productivity and power, due to the new technological conditions that arise in this historical period." (p 56). The use of these new technological conditions is present in daily activities including sending and receiving emails, participating in social networks, searching for information about goods and services, playing or downloading games, images, movies or music, finding a job or sending a job application, participating in online surveys or voting, downloading software, consulting encyclopedias, uploading content, searching for information related to health, using online banking, taking an online course, finding information on education , training or course offerings, buying goods or services, selling goods or services, searching for information and statistics from public institutions, downloading various formats from government agencies, loading forms and documents in public institutions. It is important to determine how

technology is used today, since its evolution has generated changes in all aspects of live and to the benefit of a large part of society.

We investigate articles related to the use of technology. One article of particular interest is "The digital gender gap in Spain and Europe: Measurement with composite indicators" (Castaño & Martinez 2011). The results of the study confirm the usefulness of composite indicators in the use and application of technology, in which technological inclusion is determined between men and women. The document also notes that women are disadvantaged in relation to men in the use of technology. He also mentions that difference between men and women in the use of the Internet occurs in: games, leisure, entertainment, economic situations for men, and social welfare for women. He affirms that Spain is far behind Scandinavian countries in the use of technology. The present document is organized as follows: The literature review analyzes the contributions of theorists and researchers regarding the current use of technology in European countries to establish a point of reference. We continue with the methodology that establishes the type and design of the research, population and sample. The data collection instrument and elements for its proper interpretation are discussed, as well as reliability measurements of the model used. Finally, the results achieved are presented using the application of main components, and finally the results are interpreted and concluded.

LITERATURE REVIEW

It is increasingly necessary to have access to technology, since the employment and personal environments revolve around it. Digital technology refers to a wide range of tools, devices, programs and resources that store and transmit information in digital format, known as Web 2.0 technologies (Abbott, 2007, Hague & Williamson, 2009). These technologies include Facebook, Twitter, podcasts, wikis, blogs and virtual worlds (Bicen & Cavus, 2011). The Internet allows different forms of communication including, mass communication, discussion groups, chats, communication between people through email, text messages, and video conferencing. Hilbert (2010, 2011b), divided Information and Communication Technologies (ICTs) into three major groups: technologies that transmit and communicate information, those that store information, and those that process information. It is necessary to train in the specific competences required by ICTs, to permit more appropriate use. The method by which this training is carried out is crucial for incorporation into the digital culture. Huelves (2009: 56-77) makes mention of some elements that should be taken into account when training such as memory, psychomotricity, ergonomics, and learning development.

In developed countries, digital technology is used intensively for social and academic activities (Kolikant, 2010). However, in many developing countries, access to digital technologies is more limited (Acilar 2011, Miah & Omar 2012). Digital cities are those where technology, communications and information are used for the development and improvement of the quality of life. An important component in digital cities is access to high-speed Internet or broadband, which allows users to navigate through the network. Small businesses, populations located in rural areas and households in general need broadband, so its adoption is an important policy issue to make an online society (Mossberger, Tolbert, & McNeal, 2008, p.1). "This facilitates social inclusion through greater access to resources for individuals for individual well-being, such as government services, online news, and information. In health care."(DiMaggio, Hargittai, celeste & Shafer, 2004).

Mathematical models are methods that have been automated thanks to the development of computer science. As such they are of great practical use to solve problems in society. The Principal Component method (ACP) provides a statistical tool used in various areas of knowledge. Most commonly it is used where there exists considerable data volume which increases the need to understand the data structure and data interrelations. In some cases, assumptions of the method are not met, especially those related to the level of variable measurement and the linear relationship between variables. The ACP establishes the study objective. However, if the method's assumptions are not met for the observed data, the results are not

trustworthy. In this situation, the non-linear or categorical ACP with optimal quantifications is a useful alternative.

Various statistical data catalogs exist regarding countries. Examples include the index of citizen network preparation, in the World Economic Forum (Dutta & Mia, 2008), The eReadiness index of the Economist Intelligence Union (Economist Intelligence Unit, 2009), the index of information in the society of IDC World Times (IDC, 2009), the digital opportunity index, the new opportunity index of UNCTAD ITU (ITU UNCTAD, 2007), and the digital index in Spain of the Orange Foundation (France Telecom Spain Foundation, 2006). These catalogs contain ordered indicators which show the dimensions and categories of the countries with information on technology to generate a comparable value. These indicators include aspects such as technological infrastructure, regulations and policies in technology, technological scope in market capacities, scope in business, the level of use of technology in companies and their use by citizens.

METHODOLOGY

The current study is mixed, documentary, non-experimental, descriptive and transactional. Data were downloaded from the "Eurostat" page (http://ec.europa.eu/eurostat), a site that contains statistical information from the European Union. Specifically, the section "Society and Digital Economy" was used. With the data obtained, a data matrix of 28 x 18 was generated (the 28 countries of the European Union and 18 independent variables). This matrix was used obtain the dependent variable digital achievement. Table 1 shows an analysis of the 18 exploratory variables in percentage of the population between 16 and 74 years old that used the Internet to perform some specific activity. The second column shows the number of observations for each item, followed by the mean, standard deviation, coefficient of variation, minimum observed value, the median and the maximum.

Table 1: Descriptive Statistics

Variable	N	Media	Standard Deviation	Coefficient of Variation	Min	Median	Max
A1	28	0.7057	0.1516	21.48	0.45	0.695	0.94
A2	28	0.5775	0.0972	16.83	0.43	0.58	0.75
A3	28	0.6132	0.1449	23.64	0.26	0.61	0.84
A4	28	0.4011	0.1101	27.45	0.23	0.385	0.65
A5	28	0.1618	0.0587	36.28	0.05	0.15	0.29
A6	28	0.0829	0.0626	75.54	0.02	0.07	0.32
A7	28	0.2425	0.1082	44.63	0.08	0.25	0.48
A8	28	0.4432	0.1552	35.02	0.17	0.435	0.79
A9	28	0.3557	0.1041	29.26	0.22	0.335	0.54
A10	28	0.5279	0.1046	19.81	0.33	0.54	0.71
A11	28	0.525	0.2333	44.44	0.05	0.56	0.9
A12	28	0.1636	0.0928	56.72	0.02	0.165	0.37
A13	28	0.0675	0.0412	61.1	0.02	0.05	0.18
A14	28	0.3307	0.109	32.97	0.18	0.315	0.6
A15	28	0.5246	0.1974	37.63	0.16	0.525	0.82
A16	28	0.465	0.1901	40.88	0.07	0.45	0.87
A17	28	0.3221	0.1501	46.59	0.05	0.305	0.69
A18	28	0.3379	0.1984	58.71	0.04	0.31	0.72

Table 1 shows a general analysis of the exploratory variables in percentages of the population between 16 and 74 years old that used the Internet to perform a specific activity. The second column shows the number of observations, followed by the mean, standard deviation, coefficient of variation, minimum observed value, the median and maximum. A1 = Send and/or receive emails, A2 = Participate in social networks, A3 = Search for information about goods and services, A4 = Play or download games, images, movies or music, A5 = Find a job or send a job application, A6 = Participate in online surveys or to vote, A7 = Download software, A8 = Consult wiki (encyclopedias), A9 = Upload content created by themselves, A10 = Search for health-related information, A11 = Use online banking, A12 = Take an online course, A13 = Search for information on education, training or course offerings, A14 = Buy goods or services, A15 = Sell goods or services, A16 = Search for Information and statistics of public institutions, A17 = Download several formats of governmental instances, A18 = Upload forms and documents in public institutions.

Coding of variables used in the study indicate the percentage of European population between 16 and 74 years old that used the internet to carry out some specific activity in 2017. We categorized these activities

as: A1 = Send and/or receive emails, A2 = Participate in social networks, A3 = Search for information about goods and services, A4 = Play or download games, images, movies or music, A5 = Find a job or send a job application, A6 = Participate in online surveys or to vote, A7 = Download software, A8 = Consult wiki (encyclopedias), A9 = Upload content created by themselves, A10 = Search for health-related information, A11 = Use online banking, A12 = Take an online course, A13 = Search for information on education, training or course offerings, A14 = Buy goods or services, A15 = Sell goods or services, A16 = Search for Information and statistics of public institutions, A17 = Download several formats of governmental instances, A18 = Upload forms and documents in public institutions.

Table 2 shows correlation matrix eigenvalues listed in descending order for each main component. The first column shows the variable number. The second column shows the eigenvalue obtained after running the PRINCOMP procedure included with the SAS statistical package. The third column shows the difference between each eigenvalue of each main component. By subtracting the eigenvalue of the main component 2 from the eigenvalue of the main component 1, the first difference is obtained with a value of 10,325. The fourth column indicates the most important information in relation to this study. It shows the total variability among the 18 variables explained by each main component obtained. The first value has a high value of 0.661. When multiplied by 100, we see that main component 1 itself explains 66.1% of the total variability. Finally, the fifth column shows the cumulative result of adding each proportion obtained from the various main components. The eigenvalue of main component 2, with a value of 1.57, explains 8.8% of the total variability. When added to the first component, these variables explain 74.9% of the total variability. Finally, the third principal component obtains an eigenvalue of 1.071, explaining 5.9% of the total variability. The first three components have cumulative explanatory power equaling 80.8% of total variability. Component 1 has a high value explaining 66.1% of total variability. For this reason, it is possible to consider it an index, which reduces the dimensions necessary to make a comparison between the 28 countries of the European Union.

Table 2: Eigenvalues

No.	Eigenvalue	Difference	Proportion	Accumulated
1	11.901	10.325	0.661	0.661
2	1.576	0.506	0.088	0.749
3	1.071	0.377	0.059	0.808
4	0.693	0.118	0.039	0.847
5	0.576	0.055	0.032	0.879
6	0.521	0.047	0.029	0.908
7	0.473	0.190	0.026	0.934
8	0.283	0.037	0.016	0.950
9	0.246	0.059	0.014	0.963
10	0.187	0.042	0.010	0.974
11	0.145	0.044	0.008	0.982
12	0.101	0.014	0.006	0.987
13	0.087	0.027	0.005	0.992
14	0.060	0.028	0.003	0.996
15	0.033	0.013	0.002	0.997
16	0.019	0.004	0.001	0.999
17	0.015	0.003	0.001	0.999
18	0.012	0.000	0.001	1.000

Table 2 shows eigenvalues of the correlation matrix in descending order. Rows correspond to variables noted in Table 1.

Figure 1 shows a visual corroboration of the weight that each main component has on total variability. The figure shows high values of principal component 1 and the difference between the other 17 components can be visually appreciated. The eigenvalue obtained for the main component 1 was 11,901, placing it in the

highest part of the graph. It has a difference of 10,325, with respect to the second eigenvalue which obtained a value of 1,576. From this information we summarize that 74.9% of the variability is explained taking into account only the first two main components.

Figure 1: Sedimentation Graph

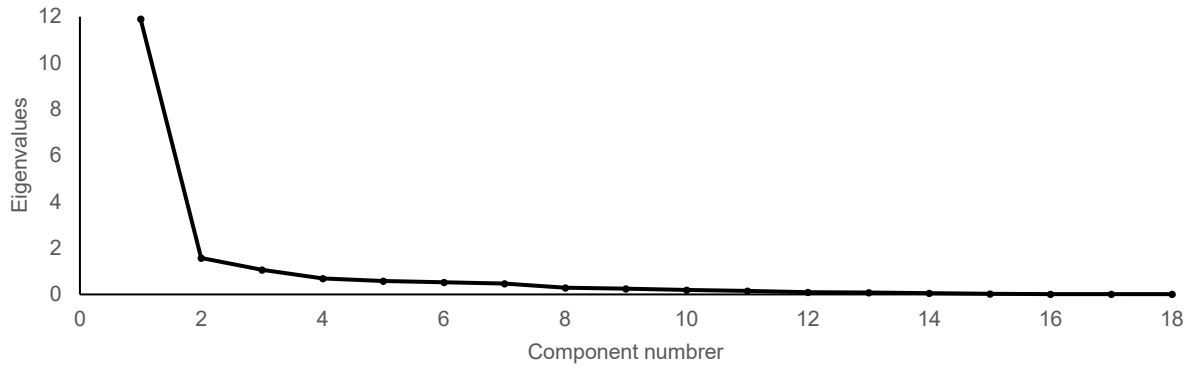

Figure 1 shows a visual depiction of the weight that each main component has on the total variability.

Table 3 shows values ordered in ascending sequence of the main component 1, corresponding to each country. When executing the SAS PRINCOMP procedure these values are calculated and stored in the program. However, when using the SORT procedure together with the PRINT procedure, it is possible to order the 18 countries by the value obtained for each main component. The component that summarizes the greatest total variability was main component 1. Main component 1 explained 66.1%, making it possible to create an index that allows for classifying the digital use by European Union countries. We conclude that Romania uses the least digital, while Denmark is located at the highest level.

Table 3: Ordered Values for the Main Component 1

Country	Prin1	Country	Prin1
Romania	-6.490	Hungary	-0.871
Bulgaria	-5.834	France	-0.272
Italy	-4.129	Austria	-0.182
Poland	-3.602	Belgium	0.774
Greece	-2.726	Spain	0.847
Croatia	-2.380	Malta	1.486
Czech Republic	-1.929	Germany	2.036
Portugal	-1.817	United Kingdom	2.919
Slovakia	-1.715	Estonia	2.954
Cyprus	-1.714	Netherlands	5.215
Lithuania	-1.430	Sweden	5.401
Slovenia	-1.391	Luxembourg	5.512
Latvia	-1.377	Finland	5.791
Ireland	-1.080	Denmark	6.005

Table 3 shows the values ordered in ascending order of the main component 1, corresponding to each country.

Table 4 contains the Pearson correlation coefficients between the 18 study variables and main component 1. A strong positive correlation is observed. On average the correlations exceed a value of 0.7, and reach values close to 0.9, except for variables A9 and A14. P-values indicate that these correlations are

significant, with values lower than 0.05 (marked with **). This high level of association, increases the reliability for the use of the main component 1 as an index.

Table 4: Pearson Correlation of the Main Component 1 with the 18 Explanatory Variables

VARIABLE	PRIN 1	VARIABLE	PRIN 1
A1	0.893**	**A10**	0.863**
A2	0.717**	**A11**	0.906**
A3	0.897**	**A12**	0.706**
A4	0.868**	**A13**	0.805**
A5	0.88**	**A14**	0.681**
A6	0.705**	**A15**	0.886**
A7	0.83**	**A16**	0.834**
A8	0.849**	**A17**	0.891**
A9	0.546**	**A18**	0.777**

*Table 4 contains the Pearson correlation coefficients between the 18 study variables and the main component 1. ** indicates significance at the 5 percent level.*

RESULTS

Table 5 shows the digital achievement index, based on the main component analysis. The value obtained in main component 1 was used to position the countries on some of the 5 scales. The eigenvalue obtained for this variable was 11,901, indicating explanatory power for 66.1% of total variability. Countries of the European Union that present the lowest level of digital achievement are Romania and Bulgaria. Those at the highest level are the Netherlands, followed by Sweden, Luxembourg, Finland and Denmark. In total the index consists of 5 scales depending on the value obtained in the main component 1. The scales are as follows: Very low (values less than or equal to -5), Low (values greater than -5 to values less than or equal to -2), Medium (values greater than -2 to values less than or equal to 1), High (values greater than 1 to values less than or equal to 4) and Very high (values greater than 4).

Table 5: Digital Achievement for the European Union

Country	Digital Achievement	Country	Digital Achievement
Romania	Very Low	Malta	High
Bulgaria		Germany	
Italy	Low	United Kingdom	
Poland		Estonia	
Greece		Netherlands	Very High
Croatia		Sweden	
Czech Republic	Moderate	Luxembourg	
Portugal		Finland	
Slovakia		Denmark	
Cyprus			
Lithuania			
Slovenia			
Latvia			
Ireland			
Hungary			
France			
Austria			
Belgium			
Spain			

Table 5 shows the digital achievement index, based on the main component analysis, where the value obtained in the main component 1 was used to position the countries in the 5 scales.

In Figure 3, the values of main component 1 against main component 2 are compared for each country. Visually, there is a considerable distance between countries with high digital achievement (Netherlands, Sweden, Luxembourg, Finland and Denmark) versus the other countries. This graph allows us to analyze the data from another perspective as well. Finland and Luxembourg are almost at the same height on the graph, however they are located in different quadrants from left to right. This is because they have similar values in main component 1 (5.79 and 5.51 respectively), but different values in main component 2 (-1.50 and 3.04). The latter is because Finland generally has a better digital use, but Luxembourg exceeds it in some specific variables. Specifically, A1, A2, A6, A7, A8, A9, A14, A15, variables are more related to the aspect of executing a particular action..

Figure 3: Main Component 1 vs Main Component 2

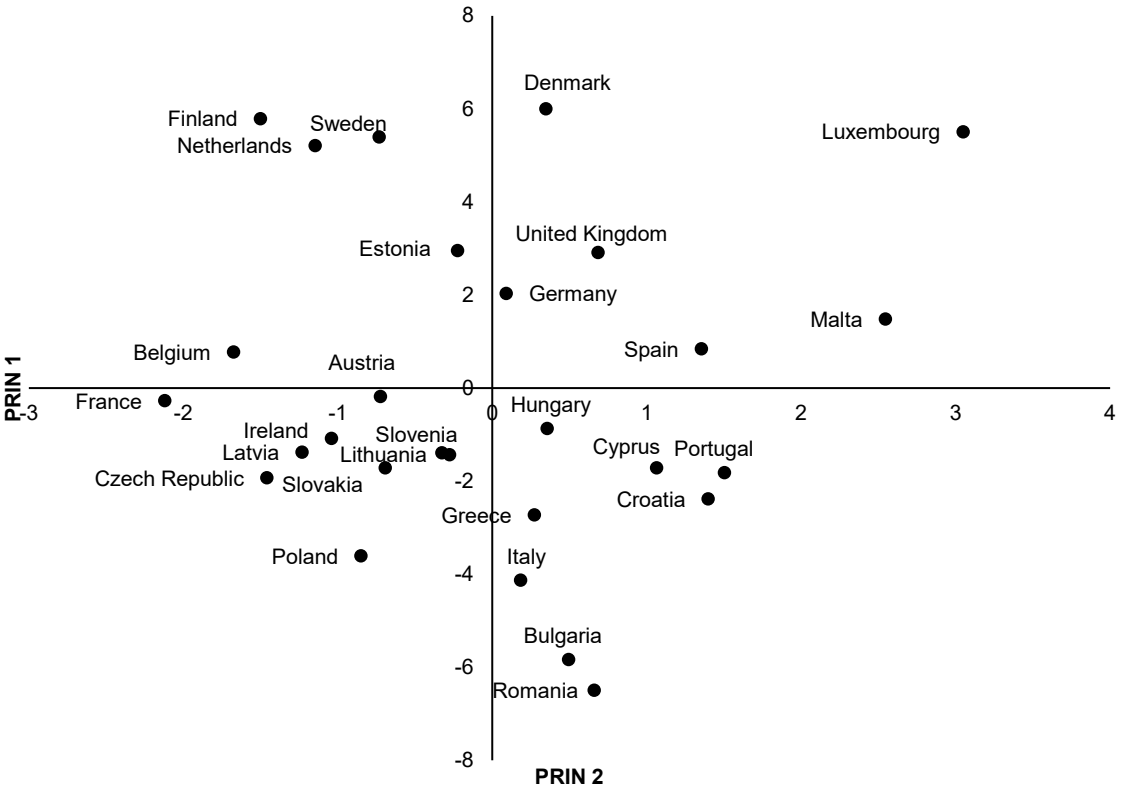

Figure 3, shows the values of main component 1 against main component 2 compared for each country.

CONCLUSIONS

This paper examines technology use in the European Union. The use of a principal components methodology allows us to summarize the variability of a phenomenon to be explained, through the eigenvectors calculated from the correlation matrix. We are further able to construct statistically validated indexes. By using 18 variables that described the use of information technologies in different areas of the sample countries, it was feasible to build an index through main component 1. This component managed to concentrate 66.1% of the total variability. We examine Pearson correlation analysis between the 18 study variables and the main component 1. Some 13 of the 18 variables presented a correlation coefficient greater than 0.8, at a level of significance of 5%. The digital achievement index proposed in the present study, allows us to classify the countries based on 5 different scales. It is then possible to evaluate areas of opportunity regarding the use of technology in each of the nations. Policymakers can further make

decisions regarding ICT use policies of the government. Similarly, individuals can make investment decisions. Countries that presented the lowest level of digital exploitation were Romania and Bulgaria. Countries at the highest levels were the Netherlands, followed by Sweden, Luxembourg, Finland and Denmark. Analysis through time by means of this type of index allows us to show the progress or regression in terms of digital use. We recommend replicating this type of study in other phenomena.

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BIOGRAPHY

Ana Isabel Ordóñez Parada is a Doctor in Public Administration from the International Institute of Law and the State. Associate professor at the Autonomous University of Chihuahua, Faculty of Accounting and Administration, attached to the Chair of Technologies and Information Management, Research Methodology. She can be contacted at the Faculty of Accounting and Administration, of the Autonomous University of Chihuahua, Circuito Universitario 1, Campus II UACH, 31125 Chihuahua, Chih., México.

Carlos Cristian De la Rosa Flores is a professor in Finance from the School of Accounting and Administration of the Autonomous University of Chihuahua. Coordinator of the Virtual Education Department at the Accounting and Administration School of the Autonomous University of Chihuahua. He can be contacted at the Faculty of Accounting and Administration of the Autonomous University of Chihuahua, Circuito Universitario 1, Campus II UACH, 31125 Chihuahua, Chih. México.

Carmen Romelia Flores Morales holds a PhD in Administration from the School of Accounting and Administration of the Autonomous University of Chihuahua. Secretary of Planning in the Accounting and Administration School of the Autonomous University of Chihuahua. She can be contacted at the Faculty of Accounting and Administration, Autonomous University of Chihuahua, Circuito Universitario 1, Campus II UACH, 31125 Chihuahua, Chih., México.

Luis Raúl Sánchez Acosta holds a Master's Degree in Finance from the School of Accounting and Administration of the Autonomous University of Chihuahua. Director of the School of Accounting and Administration of the Autonomous University of Chihuahua. He can be contacted at the Faculty of Accounting and Administration, Autonomous University of Chihuahua, Circuito Universitario 1, Campus II UACH, 31125 Chihuahua, Chih., México.

Irma Leticia Chávez Márquez is a Doctor in Public Administration from the International Institute of Law and the State. And PhD in Administration from the School of Accounting and Administration of the

Autonomous University of Chihuahua. Associate professor at the Autonomous University of Chihuahua, Faculty of Accounting and Administration, attached to the Chair of Research Methodology. She can be contacted at the Faculty of Accounting and Administration of the Autonomous University of Chihuahua, Circuito Universitario 1, Campus II UACH, 31125 Chihuahua, Chih., México.

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Contact Information

Mercedes Jalbert, Managing Editor
The IBFR
P.O. Box 4908
Hilo, HI 96720
editor@theIBFR.com

Website

www.theIBFR.org or www.theIBFR.com

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