

**VOLUME 3
ISSUE 2
YEAR 2015**

Expert Journal of Business and Management

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Expert Journal of Business and Management

<http://business.expertjournals.com>

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The purpose of the *Expert Journal of Business and Management* is designed to be an open source forum for a dissemination of relevant and original scientific articles dealing with aspects of business and management. *Expert Journal of Business and Management* is an interdisciplinary journal that aims to publish thought-provoking and insightful articles of interest to business research and management.

Expert Journal of Business and Management provides insights and foresights to practitioners (CEOs, boards of directors, industry consultants, strategic executives, and managers) and scholars (academics, researchers, lecturers, students) interested in business management articles.

Submitted papers should cover theoretical or empirical manuscripts meant to provide relevant insights into the current management and have significant implications for business practice and research. Nonetheless, *Expert Journal of Business and Management* also publishes research articles, empirical studies, case studies, research notes, simulations, teaching notes, and book reviews.

All manuscripts should reflect original contributions and not be under consideration for publication elsewhere. The submitted papers should exhibit relevancy, value, originality, argumentation, reasoning, and analysis. *Expert Journal of Business and Management* is a double peer review process and is published by Sprint Investify.

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Publisher

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Expert Journal of Business and Management

Editors in Chief

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Volume 3, Issue 2
Year 2015

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Expert Journal of Business and Management

Volume 3 • Issue 2 • 2015 • ISSN 2344-6781

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Editor's Introduction to Volume 3, Issue 2 of Expert Journal of Business and Management

Simona VINEREAN*

Sprint Investify

The second issue of the third volume of *Expert Journal of Business and Management* presents very interesting theoretical and empirical analyses that investigate business and managements issues from different geographical frameworks and valuable global applications. Further, I present a short description of each article published in *Expert Journal of Business and Management*, vol. 3, issue 2.

Prinsloo, Walker, Botha, Bruwer, and Smit, in their study '*The Influence of Combined Assurance Initiatives on the Efficiency of Risk Management in Retail Small and Very Small Enterprises in Bellville, South Africa*' explore the economic and financial strains SMMEs in South Africa experience and the adequate risk management strategies that are deemed necessary for these entities. Based on their primary research on a panel of managers from South Africa, the authors have identified the major risks that pose threats for the operations of SMMEs, such as theft and losses, competitive business environments, limited financial resources, weak liquidity levels and weak profitability levels, among others. This paper showcase an intriguing point of view of the South African business environment.

In the article entitled '*LEAN Tools in the IT Sector*', Zoltán Vajna addresses the research question on how these tools, that have proven their efficiency in production management, can be adapted to increase the efficiency of IT processes. After exploring the possibilities of implementing the LEAN tools in IT management, the authors also applied a questionnaire aimed at discovering the opinions of managers in relation to 'LEAN-ifying IT'.

In their article '*Competence Utilization for Innovation Capabilities – A Question of Trust?*', Bolzern-Konrad, Egger, and Šumilo, propose interesting research premises that combine trust, from the standpoint of the organizational values, with employee competence utilization, and trust with innovation, from the perspective of competency. To examine these research questions, the authors employ two empirical studies using data from German and Austrian mid-sized companies. Their findings show that all elements of trust show a significant correlation to employee competence utilization. Moreover, in both studies of the paper, different items of trust displayed a positive correlation with innovation indicators.

Besong Besong provides a theoretical perspective of stress and time in his paper entitled '*Stress and Time Management Settings in University of Maroua, Cameroon*'. Effective time management and absence of stress are two social objectives that are of immense interest to organizational managers. The author recommends courses of action through which management can avoid time waste and methods to minimize stress. Moreover, the paper also sheds light on the prospects of a healthy work environment and their positive outcomes on any organization's bottom line.

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Article History:
Available Online 31 December 2015

Cite Reference:
Vinerean, S., 2015. Editor's Introduction to Volume 3, Issue 2 of Expert Journal of Business and Management. *Expert Journal of Business and Management*, 3(2), pp. i-iii

Nyerki, Lippert, Nyerki, E. Jr, in their paper '*Producing Just Papers or Creating Added Value? Snap-Shot about Quality Systems at Hungarian SMEs*', they tackle certification of quality management systems in small and middle sized companies, by exploring the responses of 50 managers from Hungary. Their study has showed that there is a notable gap between written procedures and the daily operations of companies. Furthermore, based on their findings, the authors propose different management practices so that the quality management systems can be implemented and sustained in daily operations.

Ibarra Morales, Velázquez, Partida, and Franco wrote and published a research paper, entitled '*Quality Service and its Relation with Global Satisfaction in Fast Food Consumers. A Case Study*', which examines the concepts of quality service and customer satisfaction. More specifically, in this study, the authors undergo a comprehensive analysis of quality service for fast food in Mexico, by using the Service Performance (Servperf) as a model to examine consumer satisfaction on a qualitative sample of Burger King's customers. For their empirical analysis, the authors use various methods of validation of the main relationship and research question of their study.

Philipp, in his article '*Are Housing Markets Decoupled? A Case Study of Residential Real Estate Affordability in Austria*', explores two main research questions: (i) the impact of changes in net household incomes in comparison with the changes in real estate prices in Austria, and (ii) the impact of changes in the base interest rate on the affordability of real estate in relation to the household income. Philipp's comprehensive and innovative research led to various interesting results related to the prices for dwellings and house affordability.

Jasanta Peranganing's paper, '*A Conceptual Mapping Resource Advantage Theory, Competitive Advantage Theory, and Transient Competitive Advantage*', approaches various theories that are meant to explain important strategies in organizations that need to pursue innovation in order to remain competitive in a fierce business environment. The theoretical framework created in this article is comprehensive and opens the discussion of the importance of human development supported by dynamic resources.

Akpan and Ayandele explored two main topics of organizational management, namely safety and security management and control, in their paper entitled '*Remodeling Strategic Staff Safety and Security Risks Management in Nigerian Tertiary Institutions*'. Their results showed a positive relationship between the funding of security management and workers' performance. Most importantly, their study offers practical suggestions for implementation in higher education institutions in order to assure a safe environment for staff in distress working situations.

Alexander Stelzer extends the management literature related to organizations in his article '*Global Leadership and Organizational Change from Past to Now*'. He explores the concept of organizational theory from the point of view of classical approaches, behavioral approaches, and situational approaches. The author also proposes a differentiation between firms and educational organizations, based on their distinct ways of operation.

Majdi A. Quttainah's paper '*Upper Echelon Theory: Role of Community and Strategy*' examines an intriguing research question related to the impact of community on framing the cognitions of CEOs and top executive. Furthermore, the author extends his study by exploring the ways in which an organization can overcome the boundaries associated with its location and the ways in which it can adapt to grow both domestically and internationally. This original study offers theory-backed propositions that add to current knowledge on upper echelon theory and its relation to community's impact on decision-making for managers.

The article '*The Impact of SOX Adoption on the Compensation of Non-US Companies' Boards: The Case of Canadian Companies*', authored by Nadejda Serdiuc and Hanen Khemakhem, provides an empirical analysis of 17 Canadian companies listed on US stock exchanges as it examines the existence of a relationship between the adoption of SOX and the board of directors' rise of cash compensation. Their ANCOVA-related findings also highlight different effects of the SOX according to the size of the companies sampled for this research.

Rosalina Jaime Meuly's paper ('Supplier Analysis of the IMMEX in Sonora') provides an interesting read on the factors that prevent local suppliers, from Sonora, Mexico, in playing a bigger part at a local business and in offering their services to international companies. By approaching notable and appropriate literature sources related to different supply models, the author explores in detail the advantages and disadvantages of local supplies and their opportunity to further development. Also, this study also offers perspectives and recommendations for local government to monitor and sustain the activities of local suppliers.

In '*Human Resource Management's Marketing Approach and Its Contribution Towards Employee-Satisfaction*', Minder and Balina discuss employer attractiveness for acquiring and retaining top talent, by pursuing a marketing approach in achieving employee satisfaction. The empirical analysis of the quantitative research involves causal modelling and triangulation, as well as exhaustive explanations of the results and potential implications. Their findings exhibit a direct relationship between an HRM from a marketing perspective and employee satisfaction. Moreover, their analysis also highlights the importance of this approach in relation to a company's brand awareness on the labor market and to the attractiveness of an organization for potential employees.

Athanasios Vasilopoulos's article entitled '*Linear and Non-Linear Regression: Powerful and Very Important Forecasting Methods*' presents comprehensive analyses of four types of regression (linear model, exponential model, power model, quadratic model) which are examined through manual calculations and MINITAB compilations. His detailed input offers other researchers valuable insights on how to choose the most appropriate model in terms of 'best-fit' for a widely popular forecasting technique.

A Final Thought

On behalf of the *Expert Journal of Business and Management* Editorial Board, I would like to thank our Authors for publishing their valuable research with us, our Reviewers for their incredible work ethic and commitment, and our Readers for advancing and disseminating the work we publish in their future articles!



The Influence of Combined Assurance Initiatives on the Efficiency of Risk Management in Retail Small and Very Small Enterprises in Bellville, South Africa

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According to the South African Small Business Act No. 102 of 1996 Small Medium and Micro Enterprises (SMMEs) are regarded as separate small business entities owned by one or more owners; operating in various sectors of the national economy. SMMEs play a significant role in contributing to the South African economy, particularly by means of providing employment opportunities and assisting in the equal distribution of wealth. Albeit the latter prior research reveals that 80% of SMMEs do not 'survive' beyond their first five years of existence. Plausible reasons for the latter include the influence of micro-economic factors and macro-economic factors; resulting in direct, inevitable risks being placed on the overall existence of SMMEs. In order to identify and manage these risks, SMMEs need to make use of adequate risk management strategies. More often than not a risk management strategy should eliminate and/or mitigate risks and provide reasonable assurance that business objectives will be achieved in the foreseeable future. To assist in the attainment of the latter, combined assurance initiatives should be used since it is believed to enhance both the understanding and treatment of risks; providing management with optimum assurance that its relevant objectives will be met in the foreseeable future. Stemming from the above, the perception was formulated that SMMEs do not have adequate risk management strategies in place due to the lack of combined assurance initiatives. This research study consisted of survey research whereby 30 questionnaires were collected from SMME management (i.e. owners and/or managers) – all of whom had to adhere to a strict set of delineation criteria. It was found that SMMEs make use of semi-formal risk management strategies to mitigate and/or eliminate risks which are somewhat effective, but applicable risks are not optimally managed due to a lack of ample combined assurance initiatives.

Keywords: *small and very small enterprises, risk management, risk management strategies, risk, assurance, combined assurance*

JEL Classification: G32

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Article History:

Received 22 March 2015 | Accepted 19 April 2015 | Available Online 19 May 2015

Cite Reference:

Prinsloo, S., Walker, C., Botha, L., Bruwer, J.P., and Smit, Y., 2015. The Influence of Combined Assurance Initiatives on the Efficiency of Risk Management in Retail Small and Very Small Enterprises in Bellville, South Africa. *Expert Journal of Business and Management*, 3(2), pp.63-81

1. Introduction

Small Medium Micro Enterprises (SMMEs) are formally defined in terms of the South African Small Business Act No. 102 of 1996 as separate and distinct business entities, including cooperative enterprises and non-governmental organisations, managed by one or more owner which, including its branches or subsidiaries, if any, are predominantly carried on in any sector or subsector of the economy (South Africa, 1996). Furthermore, the South African government views SMMEs as important to achieve three main objectives which are: 1) to alleviate poverty, 2) to create employment opportunities, and 3) to promote economic growth (South Africa, 1996). The importance of SMMEs is especially significant in developing economies. In the case of South Africa, these entities contribute between an estimated 27% and 34% towards the national Gross Domestic Product (GDP) (Department of Trade and Industry, 2008). In a global context the importance of SMMEs is substantiated by Shah and Khedkar (2006) who aver that significant contributions, in respect of employment figures, manufacturing and exports statistics and the national GDP, mainly derive from SMME activities (Roberts, 2006).

Notwithstanding the above Giliomee (2004) is of the opinion that more than 80% of South African SMMEs do not 'survive' beyond their first five years of existence and therefore, the objectives as imposed on SMMEs, as per their legislative definition, are not being attained with great success. Both macro-economic factors and micro-economic factors, such as uncertain financial prospects, government regulations (law), increases in inflation, increases in interest rates and market instabilities, among others, have been reported to have an adverse influence on the existence-rate of SMMEs (Brink, et al., 2003). The Department of Trade and Industry (2008) make mention that SMME leaders generally do not possess the skills required to manage, maintain and/or develop their respective businesses which results in the ineffective generation of income. Hence it is not surprising that the failure rate of SMMEs in South Africa places a stigma on these entities to be very 'risky' (Bizbooks, 2008).

Manu (2005) explains that a "risk" can be viewed as a possibility of an incident happening that will impact upon the objectives of an organisation, be it positive or negative. In turn, the management of such risks is a whole process, effected by an entity's relevant management (and other personnel), in a strategic setting, to help identify potential events that may affect the business and manage them according to the 'risk appetite' of the relevant business (COSO, 2004). The latter should evidently provide reasonable assurance regarding the achievement of a business' objectives. Furthermore, the Institute of Internal Auditors (2009) explains that risks should be managed by means of utilising preventive, detective and corrective measures – holding strong relevancy to the Enterprise Risk Management (ERM) framework. The ERM framework pertains to the identification, evaluation, controlling, monitoring and reporting of risks - ensuring that risks are managed effectively all together, other than being managed in 'silos' (Beasley, et al., 2006).

To aid in the management of risks Simnett, et al. (2009) explain that different assurance providers exist to provide businesses with 'information' about their identified risks (hazards and opportunities), and recommends the best way(s) in which these risks need to be managed to provide optimum assurance that businesses' objectives will be attained. Assurance providers are generally demarcated as 'internal assurance bodies' and 'external assurance bodies'. These assurance providers should find evidence of controls that have been put in place to prevent risks from realising and also recommend ways in which to minimise the related adverse impact in the event of an occurrence of threats. Businesses holistically benefit from assurance related 'services' because it improves the efficiency of risk management within a business. Assurance that is provided in a collaborative manner between 'internal assurance providers' and 'external assurance providers' is better referred to as 'combined assurance' (Grant Thornton, 2012).

The crux of the matter, according to KPMG (2009), is that effective risk management and optimum assurance are attained by implementing the "three lines of defence structure". The first line of defence constitutes of assurance provided by management in their review of daily business processes. The second assurance line is provided by oversight functions within the entity to ensure compliance with organisational policies, procedures, laws and regulations. Independent assurance providers that provide assurance over the mentioned business operations and oversight functions form the final line of assurance (KPMG, 2009). These oversight functions are generally monitored by the audit committee of an organisation which, in turn, oversees the integrated reporting, internal financial control and risk management processes (Institute of Directors, 2009). The role of the audit committee is supported by the internal audit function, external audit function, as well as other assurance providers.

Although most SMMEs do not necessarily have the resources to employ formal audit committees (Ngary, et al., 2014), the owners and/or managers should take up the responsibility of fulfilling the tasks of an audit committee – ultimately taking on sole responsibility for ensuring that assurance activities are 'on track'.

King III corroborates the importance of the audit committee function in SMMEs by encouraging private companies, regardless of size, to voluntarily appoint audit committees if resources allow for it (Institute of Directors, 2009). Hence, it is clear that SMME leaders are placed in a disadvantaged position through the lack of resources to identify imminent risks which their businesses face due to the lack of proper internal controls and assurance activities (Noorvee, 2006).

Stemming from the above it is clear that SMMEs are influenced by the existence of risks and, as such, these risks need to be effectively managed. Due to the fact that a combined assurance initiatives are not 'mandatory' for SMMEs (and due to various resource limitations) it is highly probable that these entities are not necessarily managing their risks as effectively as they should. Hence, the authors formulated the perception that SMMEs do not have adequate risk management strategies in place due to the lack of combined assurance initiatives

In order to shed light on the latter research problem, the following questions were asked:

- What type of risks do SMMEs encounter?
- How do SMME leaders identify risks?
- How do SMME leaders manage identified risks?
- What assurance providers do SMMEs make use of?
- What is the value that these assurance providers add to SMMEs?
- To what extent do SMMEs make use of combined assurance?

2. Literature Review

2.1. Overview of South African SMMEs

The National Small Business Act No. 102 of 1996, as replaced by The National Small Business Amendment Act 26 of 2003, and enacted by the South African government, refers to SMMEs as separate and specific business entities, which are managed by one or more owner(s) trading in any sector and/or subsector of the national economy (South Africa, 1996). The above-mentioned Act further classifies SMMEs in terms of their size as "micro", "very small", "small" and "medium" (South Africa, 2003). The categorisation of SMME sizes are based on one or more of the following criteria: 1) the number of employees employed on a full-time basis, 2) total turnover per annum, 3) total gross asset value (excluding fixed property). A more detailed description of the latter-mentioned is depicted in Table 1 below in terms of retail enterprises:

Table 1. Classification of SMME sizes in the retail industry (*Source: South Africa, 1996*)

	SIZE CATEGORIES OF SMMEs			
	Medium	Small	Very small	Micro
Number of full time paid workers	Between 51 and 100	Between 11 and 50	Between 6 and 10	Between 0 and 5
Turnover per annum	Between R 15 000 001 and R 30 000 000	Between R 3 000 001 and R 15 000 000	Between R 150 001 and R 3 000 000	Between R 0.01 and R 150 000
Asset Value (excluding fixed property)	Between R 2 500 001 and R 5 000 000	Between 500 001 and R 2 500 000	Between R 100 001 and R 500 000	Between R 0.01 and R 100 000

Prior research reveals that SMMEs are significant to any economy, especially in that of developing countries due to the important role they fulfil in terms of job creation and reducing unemployment (SEDA, 2010; Salie, et al. 2014). The latter is further substantiated by the fact that SMMEs contribute approximately 30% towards the South African GDP and are responsible for providing an estimated 80% of all local employment opportunities (National Credit Regulator, 2011). Abor and Quartey (2010) posit that South African SMMEs contribute between approximately 30% and 57% to the national GDP and are responsible for employing an estimated 91% of the national workforce (National Credit Regulator, 2011). In core SMMEs contribute significantly towards the maintaining of millions of households (i.e. of employees and/or business leaders) resulting in poverty alleviation, reducing inequality, maintaining social stability as well as environmental solidity (SEDA, 2010).

In spite all of the significant contributions of SMMEs it is Verduyn (2011) who avers that the failure rate of SMMEs in South Africa, within their first five years of existence, it is estimated at around 80%. To better substantiate the latter, Biyase (2009) found that, in a more recent dispensation, an approximate 10,000

South African SMMEs fail on a monthly basis. Stemming from the latter, South African SMMEs are believed to have one of the weakest business-existence rates in the world (Fatoki, 2014).

2.2. Economic Factors Which South African SMMEs Face

The latter dispensation has generally been pinned on numerous economic ‘challenges’ such as limited funding, poor management skills, lack of inadequate training and education, just to mention but a few (Mogashoa, 2013). Underlying adverse influences like macro-economic factors (e.g. increases in inflation, fluctuating interest rates, excessive ‘red tape’, fluctuations in the supply and demand of goods and/or services, high levels of competition, lack of funding opportunities, electrical power failures, etc.) as well as micro-economic factors (e.g. the lack of business skills, the lack of effective internal controls, low staff morale, the lack of mentoring, etc.) affect the actual existence of South African SMMEs in an adverse manner (Bruwer, et al., 2013; Siwangaza, et al., 2014). As a result, prior research suggests that these economic factors ‘cultivate’ a magnitude of risks which South African SMMEs have to face.

2.3. Risks Influencing South African SMMEs

The Institute of Internal Auditors (2009) defines a risk as the uncertainty of an event occurring that could have an impact on the achievement of objectives, be it positive or negative. According to Jung (2010) the most common risks which SMMEs are likely to face include: 1) decreases in actual successful sale transactions, 2) decreases in cash on hand, 3) severe declines in demand for goods and/or services, 4) diminishing relationships with debtors due to late payments, 5) diminishing relationships with creditors due to late payments, 6) decreases in available working capital, 7) increases in costs of material, labour and/or overheads, 8) increases in the probability of non-compliance with rules, regulations and/or formal policies, and 9) decreases in the integrity of information to make sound business decisions due to a lack of knowledge pertaining to the target market(s). Moreover Bruwer, et al. (2013) aver that risks can be strategic in nature (has a direct influence on the vision and mission of a business), operational in nature (has a direct influence on business operations), reporting related (has a direct influence on the manner in which financial information is reported) and/or compliance related (has a direct influence on the manner in which policies, rules and regulations are adhered to). In fundamental nature it is of paramount importance that these risks are managed to such an extent that they do not realise (preventative controls) and/or that they are adequately identified when realising (detective controls) and/or adequately dealt with (corrective controls) (Smit, 2012). To manage risks effectively the concepts of “probability” (the likelihood of risks occurring) and “materiality” (impact of risks when they occur) need to be taken into account (Coetzee, et al., 2013). Risks can be demarcated into three categories, namely inherent risks, control risks and detection risks (Institute of Internal Auditors, 2009):

- **Inherent risks:** These risks form an integral part of the organisation’s operations and may occur regardless of the internal controls that are present. Inherent risks are present due to nature of the business and/or industry the organisation operates in.
- **Control risks:** These risks could materialise amidst the existence of internal controls but are not prevented or detected by these controls before such risks actually materialise. In essence such risks serve as indication that the internal controls of an entity are not operating as effectively as it should.
- **Detection risks:** These risks include risks of material misstatements not being detected by an assurance provider. Due to inadequate controls, the chances of such risks to realise become greater.

2.4. Risk Management

The evolution of risk management was mooted by the recognition of management as a profession (Kloman, 1984, cited by Valsamakis, et al., 1996, p.13). Management is generally tasked with the responsibility of protecting and securing the income-generating assets of an organisation (Valsamakis et al., 1996, pp.13-14). This entails the development of a structured function in terms of which an organisational risk strategy is set, and risk managers partake through a formal mechanism to deal with change.

Risk management, as it relates to a service business, is defined by Hollman and Forrest (1991, pp. 49-50) as: “The protection of a firm’s assets and profits. It is a systematic method of using a firm’s resources – physical, financial, and human capital – to realise certain objectives concerning pure loss exposures. Pure loss is one where there is a chance of loss, but no chance of gain”. From the above the analogy can be drawn that risk management is a structured approach that utilises various techniques to manage an organisation’s exposure (Smit, 2012).

The increase in global competition and the volatility of international markets have elevated risk management to the forefront of business thinking. An integrated risk management approach or Enterprise Risk Management (ERM) approach is suggested by Valsamakis, et al. (2000, pp.21), as it is “comprehensive”, “inclusive” and “proactive”. The evolution from ‘risk management’ to ‘ERM’ is intended to transform silo-based risk management practices to a cross-functional risk management activity, where risk identification, evaluation and management impact on the achievement of an organisation’s objectives. Integrated risk management lends itself to a coordinated approach in managing strategic and operational-tactical processes. As a result, the management of risk is not focused purely on the management of negative events, but also on the realisation of opportunities (Henriksen and Uhlenfeldt, 2006, pp.122-126).

Strategy-focused integrated risk management frameworks such as DeLoach’s enterprise-wide risk management framework (DeLoach, 2000, pp.213), COSO’s enterprise risk management framework (COSO, 2004), FERMA’s risk management standard (FERMA, 2003) and the Australian/New Zealand risk management framework (AS/NZS 4360, 2004), incorporate a holistic perspective on the management of the total risk portfolio of an organisation (Henriksen and Uhlenfeldt, 2006, pp.111-112). The importance of risk management is highlighted by Smit and Watkins (2012) who posit that regardless of the risk management strategies or framework that are used; these strategies need to provide, to a certain extent, assurance that all risks are effectively managed and that objectives will be attained. It is therefore not surprising that ‘risk management’ and ‘assurance’ are viewed as complementary practices of one another. In essence a collaborative effort of ‘risk management’ and ‘assurance’ will aid in 1) the identification of all material risks, 2) ensuring the evaluation and analysis of risks is done correctly, 3) ensuring the effectiveness and adequacy of main controls are present, and 4) management’s addressing of intolerable risks in a proper manner (Institute of Internal Auditors, 2012a).

2.4.1. Enterprise Risk Management Defined

The Committee of Sponsoring Organisations of the Treadway Commission (COSO, 2004), defines ERM as “a process, effected by an entity’s board of directors, management and other personnel, applied in strategy setting and across the enterprise, designed to identify potential events that may affect the entity, and manage risk to be within its risk appetite, to provide reasonable assurance regarding the achievement of entity objectives”. A simplified definition of ERM is provided by Miccolis, et al. (s.a., p.xxii) when defining ERM as “a rigorous and coordinated approach to assessing and responding to all risks that affect the achievement of an organization’s strategic and financial objectives. This includes both upside and downside risks”.

According to Abrams, et al. (2007, p.221), an evaluation of the numerous ERM definitions show that they share three critical characteristics, namely in that ERM should be:

- **Integrated:** ERM must span across all functions of an organisation.
- **Comprehensive/inclusive:** ERM must include all types of risk.
- **Strategic:** ERM must be aligned with the overall organisational strategy(/ies) and organisational objectives.

As companies begin to manage risk, they realise that they cannot manage it in an isolated manner by activity, process or department alone, but rather in an inclusive, integrated way throughout the organisation. Such an integrated risk management practice entails the defining of risk (both positive and negative), the establishment of risk tolerances, the formulation of policies and procedures dealing with risk, the inclusion of risk in all decision-making processes, taking into account the interconnectedness of risks, and the reporting of risk in a consistent manner, all within the boundaries of a single business strategy of the organisation (Abrams et al., 2007:222).

A broad definition of ERM focuses on the achievement of business objectives through the participation of all stakeholders at every level of the organisation. It should be noted that ERM constitutes multidirectional, repetitive processes, where activities influence one another with the primary differentiating factor, the focus on strategy.

By embedding an ERM system into an organisation’s strategic and operational processes, risk can be managed from a holistic and systematic perspective. Such an ERM approach would enable organisations to focus on positive risk occurrences that foster sustainable growth through improved decision-making, and proactive risk management. An integrated risk management practice would enhance the organisation’s flexibility, providing a competitive advantage over competitors who do not utilise such a framework (Schröder, 2006, pp.65-66). Hence the incorporation of ERM practices within an organisation should provide management with a ‘common language’ to define and manage risk. Furthermore, an effective risk assessment process and framework would support the organisation’s strategies and risk acceptance by creating an optimum

balance between risk, control and growth, eliminating unacceptable risks and strategic errors (DeLoach, 2000, p.208).

For large and small organisations alike, ERM entails the development of organisational objectives, the identification of risks which may impact on the defined objectives, and the development of a process to manage the risk in an organisation. Small organisations have an advantage as far as ERM is concerned in that it is easier for management to be actively involved in ERM processes, than it would be in larger organisations. The development and implementation of an ERM system in a small organisation's processes would therefore be easier, especially if the following value-adding capabilities (Watt, 2007:33-40) of small organisations' ERM practices are promoted:

- The organisation's focus is directed at its mission and vision without straying.
- The organisation complies with best practices.
- A reduction in insurance premiums can be achieved.
- Avoid the over-management of risks, i.e. risk should be managed in a cost-effective manner.

2.4.2. Risk Management for Small Business

Risk and risk management are a major concern for all companies, especially small and medium-sized enterprises, which are particularly sensitive to business risk and competition (Blanc et al., 2006, p.273). A substantial number of larger organisations have developed a risk management culture consisting of complex procedures and executed by teams of experts. In smaller organisations such as SMMEs, such integrated risk management processes do not exist (Ntlhane, 1995, pp.106-107; Dupré, 2009, p.17). In SMMEs the risk management function usually resides with the owner's assessment of threats and opportunities pertaining to the enterprise (Watt, 2007, pp.33-34). Although risk management principles are common to all types of enterprises, management's risk perception and their attitude towards risk management influence the adequacy of the enterprise's risk management actions deployed (Ntlhane, 1995, p.106-107).

Implied in SMME risk management is the core principle that entrepreneurial or management focus should be aimed at recognising future uncertainty, deliberating risks, identifying possible manifestations and effects, and formulating plans to address such risks and reduce or eliminate their impact on the enterprise (Ntlhane, 1995, p.27). One of the skills required of entrepreneurs is the ability to identify and analyse risks to ensure that advantage is taken of calculated risks (Watson, 2004, pp.84-85). This managerial focus is of vital importance for SMMEs, where risk identification and control depend on the risk personality of the entrepreneur (Ntlhane, 1995, p.27). Management, when considering implementing an ERM programme or evaluating existing risk procedures, should take cognisance of the following (Bradford, 2009, p.15):

- Are the largest risks facing the enterprise identified?
- Are risk measures in place to address these risks?
- If losses do occur despite preventative measures implemented, is the enterprise prepared to handle them?
- Is a structured approach available to create opportunities out of risks?

The fact that a risk is beyond the control of management does not absolve them from the need to anticipate the risk, and reducing the impact of the risk occurrence to achieve organisational goals. Management should furthermore take cognisance of managerial risks that arise as a result of management's own actions when planning and executing business strategies. These risks may arise as a direct or indirect result of managerial actions (Berkeley, et al., 1991, p.5).

South African SMME management should be educated in risk management principles, risk handling techniques available and risk control programmes that can be used, but care should be taken in the application of risk management principles, as although risk principles are common to all types of enterprises, the application thereof differs substantially between small and larger enterprises. However, many SMMEs practise intuitive risk management when they assess the risk involved in decisions (Ntlhane, 1995, pp.106-113; Dupré, 2009, p.17).

2.4.3. SME Risk Architecture Model

The SMME risk architecture model, as depicted in Figure 1 below, was created to support SMMEs to effectively manage their risks. As a result, this model is divided into three parts which consist of 1) SMME risk consciousness, 2) SMME risk management process and 3) SMME risk management framework. The aim is to provide for a structured way of dealing with risks facing micro- and small enterprises and from which various benefits can be derived for the business. These organisational benefits include but are not limited to

the following; more focus on risks and transparency, emphasis on controlled risk environment, enhancement of achieving organisational goals.

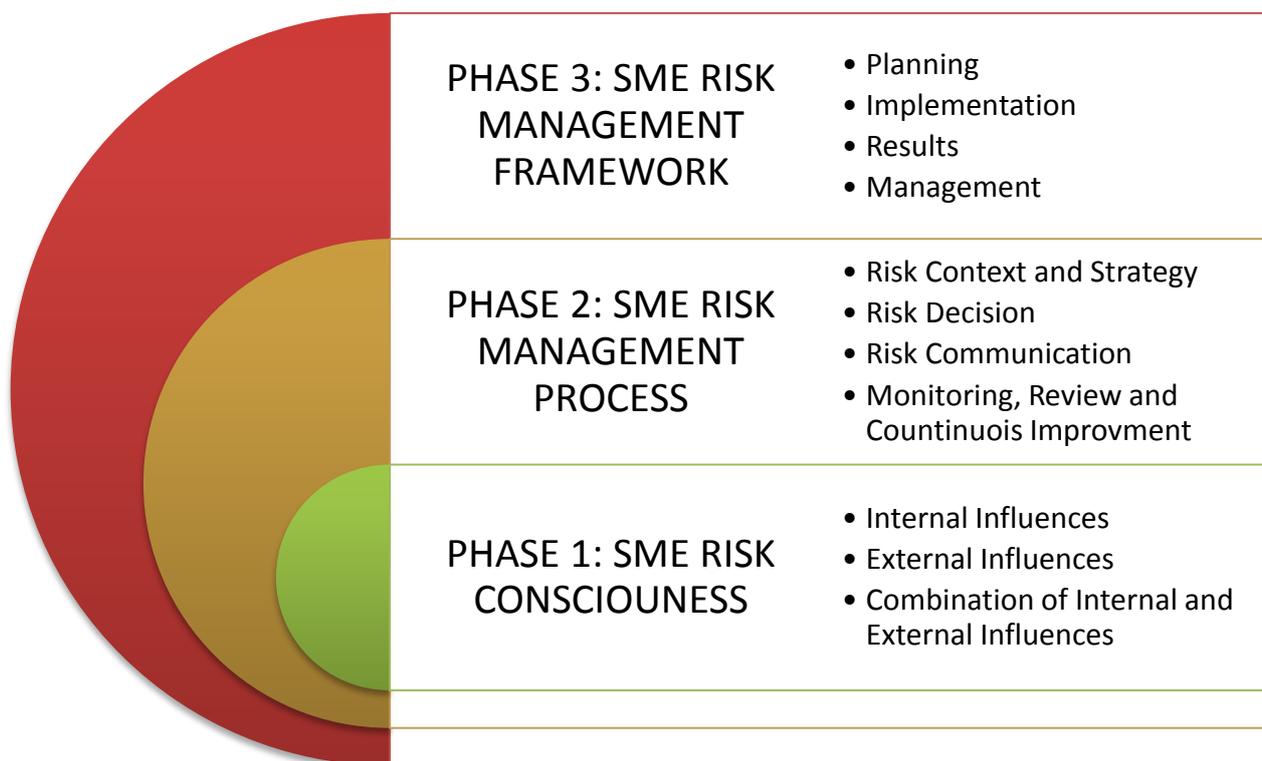


Figure 1. The SME Risk Architecture model

Source: Smit, 2012

The first element of the SMME risk architecture model is defined as the SMME Risk Consciousness (SRC). As opposed to the other generic risk architecture elements the SRC provides a focused approach on risk sources or risk areas most commonly identified in a research study on SMMEs (Smit, 2012) as actual or perceived obstacles to organisational success and survival as measured by the achievement of organisational objectives. SMME management's attention is hereby directed to the most critical risks faced by the organisation taking cognisance of risk prioritisation, as well as the key business processes and uncertainties embedded in the execution of the business plan.

The second element of the SMME risk architecture model is the Risk Management Process (RMP) (Smit, 2012). The RMP constitutes the steps SMME management should follow in addressing risk elements that impede/can impede on organisational objectives. The RMP consists of numerous organisational risk-driven activities which are grouped into four processes of risk context and strategy, risk decision, risk communication, and monitoring, review and continuous improvement.

The SMME risk management framework (Smit, 2012), also the third element of the SMME risk architecture model, provides SMME management with an approach to effectively deal with risks at all organisational levels, thereby facilitating the achievement of organisational objectives through:

- Effective risk planning encompassing the evaluation of the organisational environment, the formulation of organisational objectives and strategy, the formulation of departmental objectives and policies, defining risk context and strategy, and the identification of risk elements.
- Implementation that entails the execution of the risk management process consisting of the identification of risks that might impede on the achievement of objectives, the evaluation and risk classification of risks in terms of frequency and impact, the development and implementation of appropriate risk responses, communication entailing the development of an internal and external communication and consultation plan along with the development and implementation of a risk information system, and the monitoring and review of risk management actions to facilitate continuous improvement.

- Actioning of results that may also be termed the ‘risk action consequence’, consisting of identification of key performance indicators indicating the achievement of departmental and organisational objectives as defined in the planning phase.
- Assessing the effectiveness of the planning and risk management actions in meeting the stated objectives. In measuring the adequacy of the actions taken, management can use any formally defined performance measurement model or framework such as the balanced scorecard; or any informal, in-house designed performance measurement system.

2.5. Assurance and Assurance Providers

It is clear that risk management should provide assurance that business objectives should be attained in the foreseeable future. In order to attain such assurance, various businesses make use of different assurance providers to help mitigate and/or eliminate risks (Institute of Internal Auditors, 2012b). Assurance services are defined as an engagement in which an independent party expresses a conclusion designed to enhance the degree of confidence of the intended user after evaluating a subject matter against a set criteria. (International Auditing and Assurance Standards Board, 2014) The Institute of Internal Auditors (2009) lists a few examples of assurance providers, namely: 1) line management and employees, 2) senior management, 3) internal- and external auditors, 4) quality assurance teams, 5) risk management teams, 6) environmental auditors, 7) workplace health and safety auditors, 8) government performance auditors, 9) financial reporting review teams, and 10) sub-committees of the board, among other.

According to Vallabhaneni (2005), in a broad business dispensation, the Chief Executive Officer (CEO) is ultimately responsible for the actual attainment of business objectives. As such Teketel and Berhanu (2009) aver that the CEO can be equated to the owner and/or manager within an SMME setup. To assist the CEO (owner and/or manager in a SMME-setup) internal assurance providers and external assurance providers should support business activities, by providing inputs on the effectiveness of these activities, in relation to the attainment of business objectives (Deloitte, 2011). In addition, these assurance providers should also ideally assist management to identify all risks within the organisation and recommend ways in which to manage it soundly.

Holistically speaking, assurance providers are grouped into three levels of defence. This is depicted in Figure 2 below:

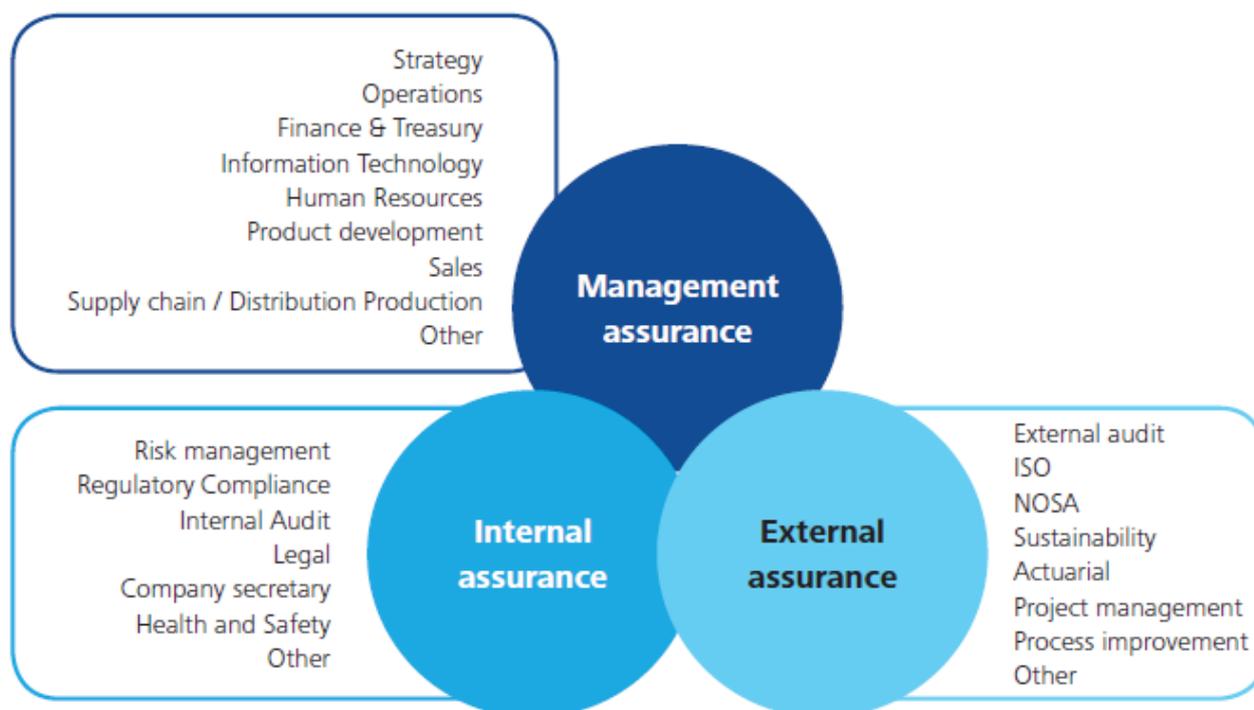


Figure 2. The three lines of defence structure
Source: Deloitte, 2011

The first line of defence is illustrated as “management assurance” where emphasis is placed on implementing preventative-, detective- and corrective controls within an organisation. The second line of

defence is portrayed as “internal assurance” where focus is placed on managing risks and reviewing the first line of defence with a specific role to confirm compliance while dealing with instances of non-compliance in the organisation. The third line of defence is “external assurance” where importance is placed on the reviewing of the first and the second line of defence in an organisation; ultimately confirming (in an independent manner) compliance and/or recommend improvements within the organisation (Institute of Internal Auditors, 2012b). It needs to be noted that in the context of SMMEs, SMME leaders are responsible for the first line of defence and the second line of defence – i.e. “management assurance” and “internal assurance” – while only a minority can actually afford to make use of the third line of defence (Siwangaza, 2014; Jiong and Li, 2010). Albeit the latter, KPMG (2009) denotes that the practice of the three lines of defence affords clarity in terms of roles, responsibility and accountability with regards to risk management and assurance – constituting combined assurance.

2.6. Combined Assurance

According to the King III Report combined assurance is deemed as a process to integrate and align assurance practices in a business to help maximise risk and governance oversight and improve control efficiencies, and optimise overall assurance to the audit and risk committee, considering the respective business’ risk appetite (Roos, 2012). Furthermore, combined assurance should assist and enhance the understanding of the overall levels of assurance and how to address and/or mitigate areas of risk (Grant Thornton, 2012).

PwC (2013) suggests that benefits of implementing a combined assurance model include factors such as coordinated and relevant assurance processes focussing on key risks; minimising business operational disruptions, improved reporting and accountability and possible reduction of assurance costs. It was further found that a combined assurance model will provide a better understanding within the organisation of “who” the assurance providers are and “what” the subject matter being assured is. This sentiment is further substantiated by Felix, et al. (2001) who found that coordination of external and internal audit assurance activities has a decreasing effect on external audit fees. This inverse correlation between external audit fees and coordination of only two assurance providers could therefore possibly be enhanced by coordination of all assurance providers, i.e. combined assurance.

Notwithstanding the later, prior research shows that combined assurance initiatives are very rare as assurance providers are performing their activities in ‘silos’ (i.e. independent lines of defence as opposed to interdependent lines of defence); resulting in risk management and assurance activities of organisations to be ineffective (IIA Research Foundation, 2012).

3. Research Design and Methodology

The research design of any research study can be classified in terms of its purpose, process, logic and outcome (Collis and Hussey, 2009). For this research study the following research design was used:

- **Purpose:** This research study was descriptive in nature as the main intention of this study was to describe a particular phenomenon at hand (see Paragraph 1) through means of empirical observations.
- **Process:** Quantitative research (positivism) was used to obtain data to solve and/or mitigate an identified research problem. This was done through means of disseminating a questionnaire-tool to a representative sample of a particular population.
- **Logic:** Deductive reasoning was used throughout this research study as the authors formulated a certain perception (see Paragraph 1) through means of consulting existing literature. Essentially this research study shifts the focus from a general understanding of a phenomenon, to a specific understanding of the related phenomenon, at hand, as authors’ perception was tested through means of empirical observations.
- **Outcome:** This research study was regarded as basic research. The authors used the findings made in this research study to shed more light on an identified research problem (see Paragraph 1) with the main intention to making it more understandable.

This research study constituted survey research whereby data were gleaned from a representative sample size of a particular population, about a general collective perception, through means of a questionnaire-tool (Leedy and Ormrod, 2010). The questionnaire-tool used consisted of 13 main-questions of a quantitative nature. As the size of the population was unknown, non-probability sampling (a mixture of purposive sampling and convenience sampling) was used to select a total of 50 respondents who had to adhere to strict delineation criteria. In addition, the authors wanted to obtain rich data pertaining to a certain focused area. Only 37

respondents responded positively to the questionnaire-tool and after validating all received responses, only 30 responses were found to be valid. In order for respondents' responses to be regarded as valid, they had to adhere to the following delineation criteria:

- Respondents had to be part of management (owners and/or managers) of SMMEs.
- Respondents must have been actively involved in their businesses' operations.
- SMMEs must have conformed to the formal definition of a "Small Medium and Micro Enterprise" as defined by the National Small Business Act of 1996.
- SMMEs must have employed between 0 and 50 full-time employees.
- SMMEs must have been in existence for at least three years.
- SMMEs must have been regarded as "very small enterprises" and/or "small enterprises".
- SMMEs must have been operating in the retail industry.
- SMMEs must have been located in Bellville (Cape Town).

All respondents were assured that all information provided by them would be treated with the highest levels of confidentiality and that their anonymity were guaranteed. It was also explained to participants that if they would decide to participate in this research study that they could withdraw from the study at any given time as their participation were completely voluntary in nature.

4. Data Analysis and Discussion of Findings

The findings made from this research study are presented under the following headings: 1) general findings, 2) risks and risk management initiatives of respondents, and 3) assurance providers and combined assurance initiatives of respondents.

4.1. General Findings

As all 30 respondents were actively involved in their businesses' processes, they were asked to indicate in which industry their respective businesses fell. A collaboration of the responses received can be viewed in Table 2 below:

Table 2. Frequency distribution table of industries in which respondents operated

<i>Value Label</i>	<i>Value</i>	<i>Frequency</i>	<i>Percent</i>	<i>Valid Percent</i>	<i>Cum Percent</i>
Building retail	1	1	3.33	3.33	3.33
Clothing retail	2	4	13.33	13.33	16.67
Electronic retail	3	3	10.00	10.00	26.67
Footwear retail	4	1	3.33	3.33	30.00
Hardware retail	6	1	3.33	3.33	33.33
Health retail	7	2	6.67	6.67	40.00
Jewelry retail	8	1	3.33	3.33	43.33
Supermarket retail	10	2	6.67	6.67	50.00
General retail	11	8	26.67	26.67	76.67
Other	12	7	23.33	23.33	100.00
<i>Total</i>		30	100.0	100.0	

The "other" industries included that of "food and beverage retail" and "motor retail". On average, respondents' respective businesses have been in existence for 19.43 years. When respondents were asked how many full-time employees they employed, 26.67% respondents employed between 6 and 10 full-time employees ("very small enterprises") while a total of 73.33% of respondents employed between 11 and 50 full-time employees ("small enterprises). On average, respondents employed 19 full-time employees. Also, out of all the responses received, a total of 13.33% of respondents indicated that they were the "owner" of their respective businesses, while another 13.33% of respondents indicated that they were the "manager" of their respective businesses. The remaining 73.34% of respondents indicated that they were both the "owner and manager" of their respective businesses. Hence one can deduce that the average respondent of the applicable questionnaire was a small general retail enterprise owner-manager who employed 19 employees while being operating his/her business from Bellville for an average of 19.43 years.

4.2. Risks and Risk Management Initiatives of Respondents

In order to understand the types of risks which respondents faced in a day-to-day setting, respondents were asked to make use of a five point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree) to rate statements beginning with the sentence: “My business is negatively influenced by ...” In Table 3 below, a summary is provided of the responses:

Table 3. Summary of risks which negatively influenced respondents

	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Std Dev</i>	<i>Mean</i>
Limited financial resources	16.67	10	23.33	30	20	1.36	3.27
Limited information to make business decisions	16.67	33.33	26.67	10	13.33	1.26	2.7
Lack of social media presence (e.g. Twitter, Facebook, etc.)	30	20	23.33	20	6.67	1.31	2.53
Lack of infrastructure (not enough basic structures to perform business operations)	46.67	10	13.33	13.33	16.67	1.59	2.43
Lack of proper technology (not having sufficient IT equipment or IT knowledge)	36.67	6.67	43.33	10	3.33	1.19	2.37
Limited skilled human resources	23.33	13.33	23.33	30	10	1.35	2.9
Limited supply and demand of products	20	16.67	26.67	16.67	20	1.41	3
Suppliers who are unreliable	13.33	13.33	26.67	23.33	23.33	1.34	3.3
Competitive business environment (due to similar companies trading in the area)	6.67	20	20	36.67	16.67	1.19	3.37
General theft and losses (burglaries, staff theft, fires etc.)	3.33	13.33	16.67	40	26.67	1.11	3.73
Weak solvency (more liabilities than assets)	20	16.67	23.33	33.33	6.67	1.27	2.9
Bad debts (debtors not paying on time or not paying at all)	33.33	6.67	23.33	30	6.67	1.39	2.7
Weak profitability (more expenses than income)	23.33	10	23.33	26.67	16.67	1.43	3.03
Weak liquidity (limited cash on hand)	16.67	13.33	23.33	33.33	13.33	1.31	3.13

Non-compliance with laws (inability to enforce contracts and possible law suites)	33.33	13.33	20	23.33	10	1.43	2.63
Non-compliance with regulations (licences can lapse and be revoked)	26.67	23.33	16.67	23.33	10	1.37	2.67
Non-compliance with recommended practices (compromise quality outputs)	26.67	20	23.33	23.33	6.67	1.3	2.63
Non-compliance with internal policies (staff not adhering and/or unaware of company policies)	30	13.33	20	16.67	20	1.53	2.83
Non-compliance with procedures of ethical standards (can damage the goodwill of the company)	20	20	13.33	36.67	10	1.35	2.97
AVERAGE						1.34	2.90

From the data in Table 3 above it is evident that the top seven risks which had an adverse influence on respondents' businesses (in general) were that of general theft and losses (74.6% of the time), competitive business environments (67.4% of the time), unreliable suppliers (66% of the time), limited financial resources (65.4% of the time), weak liquidity levels (62.6% of the time), weak profitability levels (60.6% of the time) and limited supply and demand of products (60% of the time).

Notwithstanding the above, with a global average mean of 2.90 and a global average standard deviation of 1.34, for the question, it is evident that respondents were not really adversely influenced by risks (between a "disagree" and "neither agree nor disagree" rating). This finding is contradictory to popular literature that suggests that SMMEs are adversely influenced by risks.

In order to determine how respondents identify relevant risks, they were asked to make use of a five point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree) to rate statements beginning with the sentence: "In my business risks are identified through means of..." A summary is provided of their responses in Table 4 below:

Table 4. Summary of Methods Used by Respondents to Identify Risks

	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Std Dev</i>	<i>Mean</i>
Investigating suspicious conduct	13.33	3.33	13.33	36.67	33.33	1.34	3.73
Frequent checks on security systems	13.33	3.33	20	43.33	20	1.25	3.53
Financial Audits	6.67	6.67	10	43.33	33.33	1.16	3.9
Tax Audits	6.67	6.67	13.33	50	23.33	1.1	3.77
Independent reviewer	16.67	0	30	43.33	10	1.21	3.3

Information Systems (IS) Audits	13.33	3.33	40	33.33	10	1.14	3.23
Brainstorming with staff	10	10	16.67	50	13.33	1.17	3.47
Risk register	20	0	26.67	33.33	20	1.37	3.33
Informal discussions with staff	6.67	3.33	16.67	53.33	20	1.04	3.77
Periodic stock taking	6.67	0	16.67	46.67	30	1.05	3.93
Comparisons of current and prior year financial statements	3.33	0	10	50	36.67	0.87	4.17
Staff behavior changes	6.67	0	30	46.67	16.67	0.99	3.67
Customer satisfaction surveys	13.33	10	20	36.67	20	1.3	3.4
Objectives not being met	13.33	6.67	30	36.67	13.33	1.21	3.3
Consulting other businesses in similar industries	6.67	0	33.33	43.33	16.67	1	3.63
AVERAGE						1.15	3.61

From the data in Table 4 above one can deduce that the top three risk identification methods used by respondents were that of comparisons of current and prior year financial statements (used 83.4% of the time) periodic stock taking (78.6% of the time) and financial audits (78% of the time). Albeit the fact that these top three risk identification techniques are semi-formal, a global average mean of 3.61 and a global average standard deviation of 1.15 (for the question) makes it clear that respondents were relatively actively involved in the identification of risks in and around their respective businesses (between a “neither agree nor disagree” and “agree” rating). The ‘activeness’ of respondents in the identification of risks can be justified through the statistic that 73.34% of respondents were owner-managers; with an average SMME existence rate of 19.43 years it is also evident that respondents were very concerned about their respective business’ well-being.

In order to understand how respondents manage identified risks, they were asked to make use of a five point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree) to rate statements starting with the sentence: “In order to manage risks in my business, I make use of ...” In Table 5 a summary of their responses is provided:

Table 5. Summary of Risk Management Methods Used by Respondents

	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Std Dev</i>	<i>Mean</i>
Formal business policies	6.67	0	10	53.33	30	1.02	4
Establish/maintain relationship with customers	0	3.33	6.67	56.67	33.33	0.71	4.2
Establish/maintain relationship with suppliers	3.33	3.33	13.33	50	30	0.95	4
Actively support staff members	0	0	23.33	46.67	30	0.74	4.07

Communicate risks and consequences to staff	3.33	0	3.33	60	33.33	0.81	4.2
Observations (walk through)	3.33	0	13.33	43.33	40	0.91	4.17
Implement health and safety measures	0	0	23.33	50	26.67	0.72	4.03
Frequent maintenance of security systems	3.33	3.33	23.33	43.33	26.67	0.97	3.87
Frequent maintenance of information systems	6.67	3.33	20	50	20	1.05	3.73
Financial audit reports (to determine high risk areas)	3.33	3.33	20	50	23.33	0.94	3.87
Make provision for bad debts	6.67	0	30	46.67	16.67	0.99	3.67
Make provision for losses (e.g. insurance)	3.33	0	23.33	43.33	30	0.93	3.97
Segregation of duties	6.67	0	23.33	40	30	1.07	3.87
Staff training	3.33	0	10	53.33	33.33	0.86	4.13
Audit recommendations (implementing solutions for risks which have been identified)	6.67	0	26.67	40	26.67	1.06	3.8
Monitoring previously identified risks	3.33	3.33	6.67	66.67	20	0.85	3.97
AVERAGE						0.91	3.97

Based on the data in Table 5 above, the top five risk management techniques used by respondents, to manage identified risks, were communicating risks and consequences to staff (84% of the time), establishing and/or maintaining relationships with customers (84% of the time), observations in the form of ‘walk through’ exercises (83.4% of the time), staff training (82.6% of the time) and actively supporting staff members on the job (81.4% of the time). Again, the risk management techniques used by respondents were semi-formal, but with a global average mean of 3.97 and a global average standard deviation of 0.91 (for the question) it is clear that majority of respondents made use of risk management initiatives in their respective businesses (almost an “agree” rating). This finding provides some insight as to why respondents’ relevant SMMEs have been in existence for an average of 19.43 years. In addition, the perceived effectiveness of deployed risk management initiatives, in terms of preventing, detecting and correcting identified risks, were rated by respondents, on average, at 78.6%. Although the term “effective” is viewed differently from one person to the next, it is important to take into account that all SMMEs, for this research study, have been in existence for at least 3 years (19.43 years on average). Therefore one can argue that respondents’ risk management strategies are working for them to keep their respective SMMEs afloat.

4.3. Assurance Providers and Combined Assurance Initiatives of Respondents

Since semi-formal risk identification and risk management initiatives were used by respondents, the authors wanted to discover whether combined assurance initiatives were used by respondents. First off, respondents were asked to indicate which type of assurance providers they make use of. A total of 60% of respondents agreed that they made use of external assurance providers while 60% of respondents also agreed that they made use of internal assurance providers. Of all the responses received, 69.99% of respondents agreed that they make use of quality assurance providers. Since SMMEs do make use of combined assurance initiatives more than 60% of the time, it justifies their 78.6% effectiveness rating of their risk management

initiatives – rendering their risk management strategies to be more effective than what popular literature suggests.

To shed more light on the actual value that assurance providers add to their businesses, respondents were also asked whether assurance providers assist in the achievement of relevant business objectives. This was done by asking respondents to make use of a five point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree) to rate statements beginning with the sentence: “By using these assurance providers, my business experience consistency (or improvements) in terms of ...” A summary of responses received is shown in Table 6 below:

Table 6. Summary of the Effectiveness of Assurance Providers

	<i>Strongly disagree</i>	<i>Disagree</i>	<i>Neither agree nor disagree</i>	<i>Agree</i>	<i>Strongly agree</i>	<i>Std Dev</i>	<i>Mean</i>
Improved reporting to assess the financial position of the business	3.33	6.67	10	56.67	23.33	0.96	3.9
Increasing sales turnover	0	6.67	16.67	60	16.67	0.78	3.87
Achieving higher profits	0	10	16.67	46.67	26.67	0.92	3.9
Skilled workers leading to customer satisfaction	3.33	3.33	6.67	63.33	23.33	0.87	4
Effective management and mitigation of risks	0	6.67	10	66.67	16.67	0.74	3.93
Effectiveness of internal controls	3.33	0	6.67	66.67	23.33	0.78	4.07
Achieving business objectives	3.33	3.33	6.67	60	26.67	0.89	4.03
Maximising the interest of stakeholders (investors)	3.33	13.33	30	40	13.33	1.01	3.47
Contribution towards social and/or environmental responsibility	6.67	6.67	26.67	46.67	13.33	1.04	3.53
AVERAGE						0.89	3.86

From the statistics in Table 6 above it is apparent that the value which assurance providers provided were quite significant. In core, value is predominantly added through means of the enhancement of the effectiveness of internal controls (81.4% of the time), achieving of business objectives (80.9% of the time) and aiding in up-skilling of employees to attain better customer satisfaction (80% of the time). With a global average mean of 3.86 and a global standard deviation of 0.89, the statistics in Table 6 provide strong evidence that the value of assurance providers, as used by SMMEs, were somewhat significant (between a “neither agree nor disagree” and “agree” rating).

Lastly respondents were asked how they use their relevant assurance providers. From the responses received a total of 50% of respondents indicated that they made use of only one assurance provider at any given time (i.e. either ‘external assurance provider’ or ‘internal assurance provider’), while 36.67% of respondents indicated that they make use of at least two assurance providers at any given time (i.e. both

‘external assurance provider’ and ‘internal assurance provider’). The remaining 13.33% of respondents were unsure about how they use their relevant assurance providers.

5. Conclusion

Stemming from the above, it is evident that SMMEs experience economic and financial strain. Due to these adversities, adequate risk management strategies are deemed very necessary for these entities. The starting point in a sound risk management strategy is to identify risks that are present and/or have the probability to realise in the foreseeable future. From the findings made, it is clearly evident that SMMEs were aware of the risks that threaten their businesses to a great extent. These risks include general theft and losses, competitive business environments, limited financial resources, weak liquidity levels and weak profitability levels, just to mention a few. Albeit the latter, it was found that risks do not really adversely influence SMMEs to a great extent.

In addition, SMME leaders were asked how they identified risks. It was found that SMME leaders made use of comparisons of current and prior year financial statements, periodic stock taking and financial audits. Furthermore respondents indicated that the manner in which they manage their identified risks include communicating risks and consequences to staff, establishing and/or maintaining relationships with customers, observations in the form of ‘walk through’ exercises, staff training and actively supporting staff members on the job. Albeit the fact that the latter risk identification initiatives and risk management initiatives were only semi-formal, it is imperative to note that all SMMEs, on average, have been in existence for an average of 19.43 years; hence SMME leaders must have a ‘working’ risk management strategy with an average self-rated effectiveness, by respondents, of 78.6%.

More light was shed on a probable reason as to why the risk management strategies deployed by SMME leaders were rated so high in terms of efficiency when it was found that SMMEs place reliance on assurance providers to add value to the organisation by enhancing the effectiveness of internal controls, reaching of business objectives as well as improving employee skills in order to improve customer satisfaction. SMMEs therefore see assurance providers as value adding functions which, in turn, assist in the identification and management of risks in and around the organisation.

Although only 36.67% of respondents made use of combined assurance initiatives (and 50% made use of ordinary assurance initiatives) one can deduce that if more SMMEs would utilise a combined assurance model (by making use of ‘internal service providers’ and ‘external service providers’ at the same time) it will lead to more effective risk management strategies; adding value to these entities in terms of sustainability, as well as possibly lowering assurance costs.

Acknowledgements

The authors of this paper wish to acknowledge the following individuals for their assistance with the collection of data in this research study: Xabisa Hlulani, Robyn September, Jenine Giddion, Oliver Tamo and Mkhanyisi Ncumeza.

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LEAN Tools in the IT Sector

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Nowadays the LEAN tools – with their proven efficiency – are indispensable parts of the production management. I think there is no producing enterprise that cannot utilize a wide variety of these LEAN tools. The question now is how these tools can support companies in increasing the efficiency of their supporting IT processes. In this study I will demonstrate how these well-known LEAN tools from production management can be used in IT management to create more cost-effective, efficient and transparent solutions during the IT system development and IT operation activities. I will show respectively – without attempting to be comprehensive – the most important tools of the LEAN management and I will analyse how these tools can be used in the IT sector. At the end of this study I will demonstrate what the IT managers think about the practical use of these tools.

Keywords: LEAN, IT, waste, development, efficiency, cost-savings

JEL Classification: M15

1. Introduction

We cannot really study local markets nowadays, since major international corporations are present in every market segment, it is thus safe to say then even small local producers have to compete in an international competition. Different professional organisations constantly aim to formulate new recommendations, which include principles that enable the corporations to more successfully compete in their specific market segment. This is how the LEAN approach spread from the automobile manufacturing industry a few decades ago. The most important elements of LEAN include flexibility, the identification of customer demands, providing values and eliminating losses.

Without the appropriate IT support and IT systems, no corporation can meet the modern market challenges in the 21st century. IT plays a dual role in business: we use it as a controlling tool and as a supporting tool as well. Considering the fact that IT is intertwined in everyday lives, it is safe to say that IT operation, IT system development and the results thereof are very important factors in the efficient operation of a corporation. In my view, in order to enable IT to play the largest role possible in our business results, we need to eliminate losses.

2. Eliminating Losses

In the competitive market there is a specific price the customers are willing to pay for a product. Therefore LEAN methods aim to raise profit through decreasing the losses of the specific processes, instead

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Article History:
Received 24 April 2014 | Accepted 10 May 2015 | Available Online 28 May 2015

Cite Reference:
Vajna, Z., 2015. LEAN Tools in the IT Sector. *Expert Journal of Business and Management*, 3(2), pp.82-89

of increasing prices. Toyota's Production System distinguishes between a total of seven losses (Ohno, 1988), which was later supplemented by Liker with an eighth (Liker, 2008).

These losses are the following:

Overproduction: overproducing is the result of the manufacturing process that produced to the inventory, without actual orders. The costs of overproduction appear in multiple fields of the manufacturing process, including HR, storage, energy consumption and even transportation. In order to limit overproduction, JIT transportation, application of the Kanban or "pull" principle, and one-piece flow were invented. In my opinion, overproduction in the IT field means that more functions are developed to a specific system than what is required. In such cases, the loss is apparent in the time spent, in operating and maintenance costs, but if the system's complexity increases, it will have a direct impact on the work performance of the users and the Support activity generated during operation.

Waiting: when material flow is not continuous on the line, waiting takes place. Waiting may be caused by unbalanced manufacturing, loss due to changeovers, or it may be due to the lack of materials. When reserves of the system run out, the first apparent consequence is waiting, which may be eliminated by techniques such as SMED, balanced manufacturing or KANBAN baskets of the appropriate size. In the field of IT, waiting should be divided into two separate parts: losses during development and operational time. Waiting during development can be caused by the lack of available environments, during the time of testing or re-testing, or by the non-conformity of distributing authorisations. In the development period, it is probably the lack of information or its accuracy that causes the major and frequent problems, since it affects all the other losses as well. During operation, waiting can be caused by maintenance times or slow response times.

Unnecessary movement of goods: the loss of the movement of goods occurs when the product is moved more than what is necessary for the specific process. In such cases, unnecessary expenses occur on both the HR and the logistics side. In production, this type of loss may be reduced for example by the plant layout (U-shape) and by rethinking outsourced activities. In the field of IT, the unnecessary movement of goods may apply when specific applications do not produce the required result for the first time, since this involves fixing and re-testing. The previously mentioned quality and quantity of information also leads here, since if the customer has to be visited again, it is classified as a loss. This attached loss can be eliminated most easily, if the infrastructure required for development is established at the customer (Poppendieck & Poppendieck, 2003).

Processing or quality loss: every action that is beyond the identified required values, causing loss. Re-processing or scrap (rejects) due to quality problems also mean a loss for the corporation. This loss may be reduced, if value stream mapping is performed and quality is installed into the product (SIX SIGMA). It is important to develop systems that can indicate failures and automatically stop the process, if necessary. During the course of the IT development, quality may be implemented in the process by performing continuous interaction with the customer or applying automatic testing systems. We build modular systems, and design development in a manner that disassembles it to the smallest operational elements, which are then tested and delivered. The most obvious choice is using a more iterative and agile methodology instead of the waterfall model, which would enable us to produce an adequate quality in a relatively swiftly changing environment as well (Qusef & Lucia, 2010).

Inventory: the costs of maintaining the inventory are apparent in multiple areas. Such incurred costs include the maintenance of buildings, HR, the costs of certain tools and materials, depreciation, and therefore we face a problem that is easy to grasp and calculate from a production point of view. Another disadvantage of accumulating the inventory, is that it hides the operative problems of the organisation. Therefore, in case inventory is reduced, waiting may occur on the production line. In such cases, the task is not to reload the inventory, but to investigate and eliminate the root causes of waiting. During system development, inventory can be interpreted the following way: if the specific development activity is ready sooner than it could be received by the customer for testing, we have unused capacities created. During operation, inventory may also be interpreted through the aspects of unnecessary storage space and server accumulation. Today's modern virtualization techniques can provide an answer to this, and balance the usage peaks of the unbalanced use of the specific services.

Unnecessary motion: all activities including movements that supplement our value-creating activity, shall be considered losses. The loss can be reduced by activity analysis. The lack of the previously mentioned information also leads to such loss, since if the customer has to be visited again, it is also classified as unnecessary motion. This attached loss can be eliminated most easily, if the infrastructure required for development is established at the customer (Poppendieck & Poppendieck, 2003). If it is not possible, then creating certain workgroup pages may reduce the time spent with acquiring information. During operation, the time spent on solving the repeated failure can be classified as this type of loss.

Scrap: in case we produce scrap (rejects), then the whole production process is questionable and almost everything invested in the specific product is lost. Failures and faults may also arise during development from inaccurate specifications, or obviously from simple coding errors as well.

Inappropriate utilisation of HR: if we cannot utilise the skills of our colleagues, we may easily lose new business ideas (Liker, 2008). IT is unimaginable without the appropriate knowledge, and therefore I think that this type of loss may be the most severe to an IT service provider, since this is a knowledge intensive sector, in which the "half-life" of knowledge is 1-1.5 years. I believe that trainings may solve the problem, if the operative staff lets the knowledge gained through them unfold. The availability of HR may for example be best visualised and controlled through a strategic map (Kaplan & Norton, 2005).

In the paragraphs above, I have presented the seven sources of loss identified by Taiichi Ohno, which served as the basis for Toyota's manufacturing system.

3. Establishing a Pull System

The basic principle of pull systems is that production shall always be generated by demand. By establishing an operable pull system, most of the previously presented problems can be avoided. Pull systems within a plant are realised through KANBAN cards, while in the IT sector they take the shape of closing the order or a testing round. The following figure shows the execution of a pull system IT development work. Figure 1 is based on the works of Bell and Orzen (201).



Figure 1. *Development in a pull system*
Source: Bell & Orzen, 2010

The above figure clearly shows the development is only commenced if a customer demand is generated, which is assessed by the management, and then it launches the development work.

During the course of operation, the pull system is much harder to interpret. But if we look a bit further, and assemble an infrastructure for which the undertaken SLAs (Service Level Agreements) comply with the values targeted in the BCP (Business Continuity Plan), then the expected pull system is already realised. The prepared BCP may not only contribute to the implementation of the pull system, but it may play an important role in value analysis as well, since clients always want everything as soon as possible, with ~100 % availability, but this can decrease competitiveness, as we form excess reserves.

4. Balancing Production

A corporation that fails to think about LEAN methods as one system and only manufactures strictly according to the customer demands, will soon discover the loss called 3M (Muda, Muri, Mura). The reason is the following: the unexpected nature of customer demands sometimes causes overload, or unused capacities in our systems. This is caused by the "ad hoc" nature of production, which has to be balanced. This practically means that in case of three A and three B products, the production order will be ABABAB, instead of AAABBB (Liker, 2008). Due to changing the product, losses occur at every changeover, which can be reduced by the SMED (Single Minute Exchange of Die), which means a single-digit minute changeover ability. The SMED is a four-step technique which enables reducing the changeover time to less than 10 minutes. (Shingo, 1985)

During the course of IT development continuous production is realised through the development of modular systems and the cycles created for the testing thereof, which also ensures that quality becomes a part of the product and the results will comply with customer demands. During operation the balancing of

production is implemented through virtualization technologies. This means that the system is provided with the virtual availability of resources that it does not actually possess, and thus the irregularities caused by usage can be balanced. For example the HR system runs at full capacity during payroll management, so if we find a system that is used at some other time, then the two systems can share the resources.

5. Including Quality in the Process

If we ensure that appropriate quality production can be realised at the first attempt, then we are relieved of a loss identified in one of the previous chapters. In mass production the most important goal is the operation of the lines, while according to the LEAN approach, in case of a failure, the process has to stop and shall be repaired, in order to prevent the failure from occurring again. Practically any employee is authorised to stop the line, when he faces a problem. Switches are placed along the production line, and in case of a problem the employee can use them to indicate the foreman that he faced a problem and requires help (Liker, 2008). These lights are called "andons" and they are means of visual control.

Quality can be included in the product through continuous improvement. In order to enable this, we need analysis techniques like 5W (5 Whys), RCA (Root cause analysis), FMEA (Failure mode and effects analysis), FMECA (Failure mode, effects, and criticality analysis) or FTA (Fault tree analysis).

The different monitoring systems fulfil the role of the previously explained "andon" in IT operation. In these systems, the entire analysed infrastructure is constructed based on the tree structure (in the required depth) and the specific service is located at the root of the tree. The system continuously tests the different branches of the tree, and signals to the operator if any algorithm faces an error, if there is no response, or - if applicable - when the response time is too long. In case of a failure, the specific service part is indicated in a flashy manner on the operator's screen, and he may decide whether it is necessary to intervene in the process. If the problem can be solved without shutting down, providing a continuous service is practically ensured.

By developing modular systems, not only the workloads between specification-development-testing can be distributed, but we also receive quicker feedback regarding the qualities of the completed elements, enabling faster intervention in the process and reaching the optimal result. The methodology of "fragmented" system development complies with the principle of one-piece material flow. The services of thus created system components provide a foundation of appropriate quality for satisfying further business demands.

6. Standardization

According to Henry Ford, standardization is the basis of development (Liker, 2008). He argued that the optimum of the current stage shall be reached first, and then we shall continue to work to develop it. Standardization is also an important element of the LEAN approach, which is reflected in the 5S (Seiri, Seiton, Seiso, Seiketsu, Shitsuke). The fourth and fifth S can be introduced, if the target results are already reach in the three first areas, i.e. we defined what is required for work, placed them properly and maintain them as well. The fourth and fifth S is about measurement and training.

Standardization in the IT service is primarily reflected in the ITIL or CMML SVC recommendations. This includes how our IT services should be structured in order to be able to provide high level services.

During the course of development, standardization is included in planning and system development approach according to the SOA (Service Oriented Architecture). But what is SOA? It is hard to define. Not because there was no definition, but because there are so many definitions that it is hard to decide which one is appropriate. According to the approach I find the most appropriate, the SOA is a paradigm and planning method approach that should be applied in order to get the description of a business or IT architecture. (Nicolai M., 2007) In the SOA-based philosophy, stand-alone systems cease to exist and we discuss the internal structure of the components. In the SOA maturity model of "The Open Group", the companies at the top level possess such IT infrastructure that is suitable for dynamic application development, has a reconfigurable architecture, models business processes and its control is based on an appropriate set of rules (The Open Group, 2013).

7. Continuous Learning, Development

Continuous learning is based on looking in the mirror from time to time, and analysing our deficiencies. If we know where our deficiencies lie, we can execute continuous learning, the KAIZEN (Liker, 2008). In the LEAN approach, continuous learning has four levels: the corporate, the management, the

operative and the controlling level. According to Licker, development is performed based on the Deming cycle. This relation is presented in the figure below.

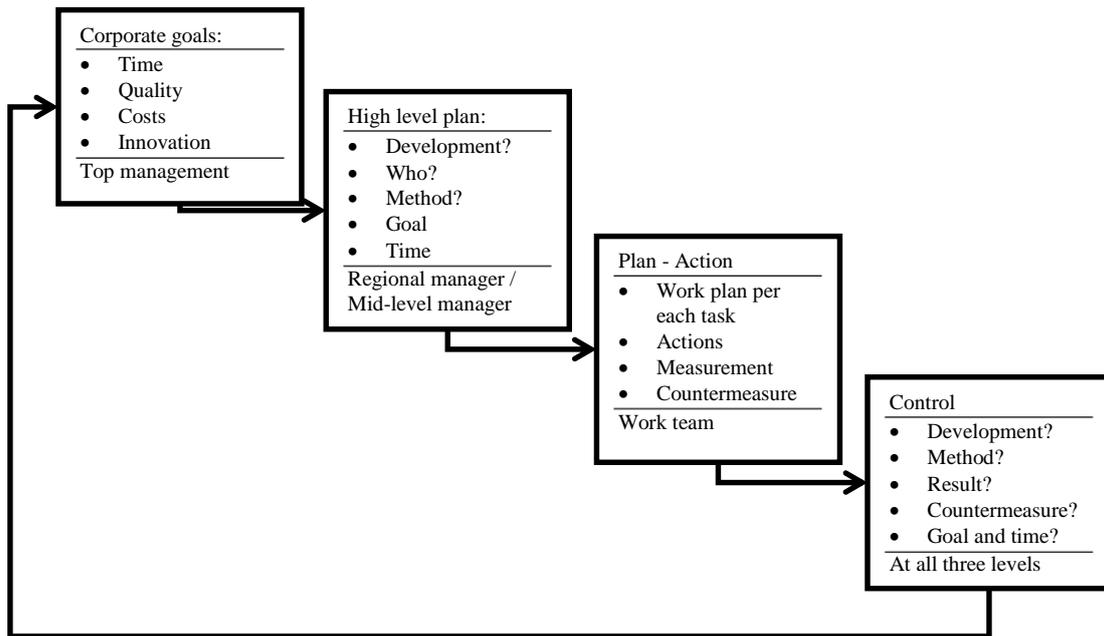


Figure 1. Division of the strategic goals of the Corporation
Source: Liker, 2008

In the world of IT, the continuous service development process is implemented by the ITIL (IT Information Library) in a seven-step model, presented in the below figure.

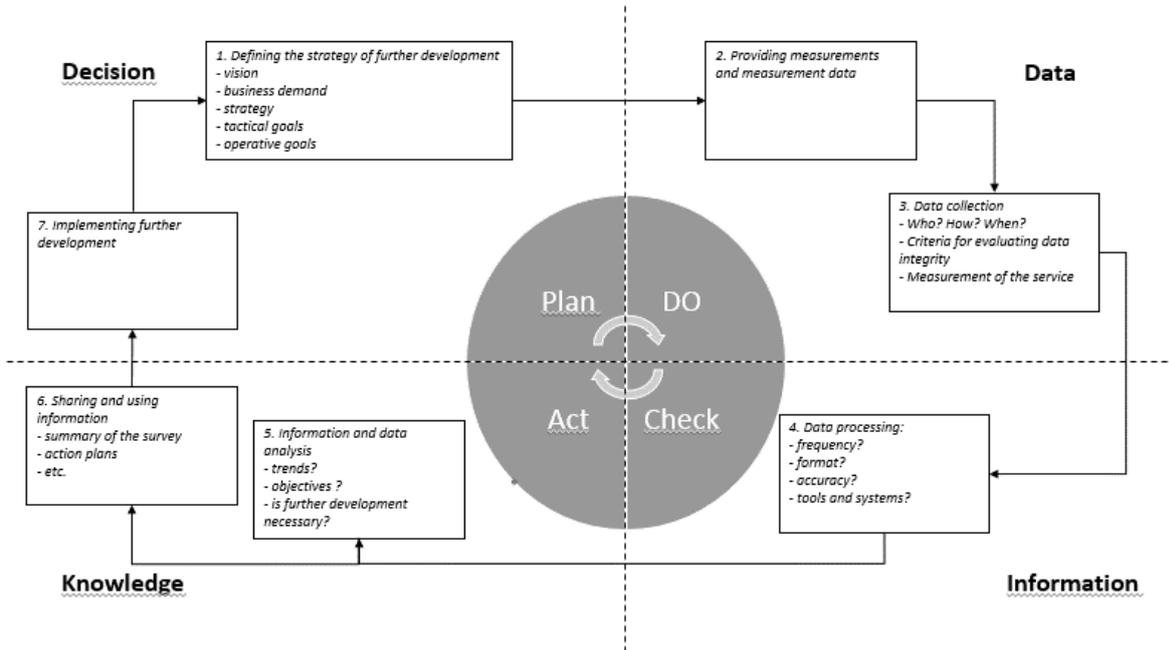


Figure 3. Service development PDCA cycle according to the ITIL
Source: ITIL, ITIL V3 Foundation, 2013

Considering the half-life of knowledge in the IT sector, it is not enough to just think about KAIZEN as a process, but the workers shall also continuously renew, otherwise their knowledge will be rendered useless. Naturally, this is true for every segment, but probably the half-life of knowledge is the most apparent in this sector.

8. Why is it worth LEAN-ifying IT?

Throughout the last few pages I summarised the LEAN tools of production management and IT services, and I tried to prove that the techniques that are able to provide competitive advantage for a corporation in a specific sector, may also bring about success to another company applying them in a different sector. Considering the fact the IT has a supporting role in the economy, the application of the previously listed methods may face problems. If these smaller battles are won, the value of IT can be increased. I think that the hardest job is to provide services as an external service provider.

In order to try to answer how the managers of the company's suppliers view the opportunities of introducing certain tools and their applicability, the Development Management of MVM Informatika Zrt. conducted an opinion poll. The answer sheet was returned by 25 top managers and project managers of more than 10 IT service providers.

Table 1 presents the arguments and opinions submitted by managers participating in the survey, which show why it is worth going forward with this hard and conflict-filled process.

Table 1. Managers' opinions on LEAN-ifying IT

Solution	Production management	IT services	Managers' opinions	What do we gain?
Value analysis	Value analysis	Analysis of business and implementation processes	There is a clear consensus that the contractor shall not only emulate any of the processes, but he shall proactively participate in its analysis as well. In order to complete this process, they need information, but they cannot receive it in the adequate quality and quantity. The complexity of the systems could be decreased, but this would also require flexibility on the customer's side.	During implementing developments we can spare time, which also means cost-savings. Less complex systems, decreasing operational costs
Eliminating losses	JIT KANBAN SMED U-shape manufacturing line	SCRUM KANBAN Outsources project team	The current contracting customs and options support agreements of a fixed scope, even in rapidly changing environments. On the customer's side, the application of iterative methods is hindered by planning problems, and therefore it is not preferred. Change-management of the projects is typically performed.	Cost-savings Quicker response ability Systems better tailored to the demands More accurate planning and delivery
Establishing a pull system	KANBAN	Customised software Iterative development techniques	Change-management is the most effective from the contractor's point of view, if iterative development methodology is applied during the introduction, but this does not necessarily involve the more accurate keeping of deadlines. The customer's side is typically not mature enough to manage iterativeness. It supports the process if partners are already involved at the beginning of the process. There is a clear demand for this.	Higher profit Returning client for inclusion in the system

Including quality in the process	SIX SIGMA SPC	Monitoring systems Modular development, reuse, SOA	Different types of monitoring systems are not the privileges of the rich, so their application opens new horizons in the field of proactivity. If possible, the application of standard solutions is preferred to custom development, which also affects competitiveness.	Faster systems with less failures A system better fulfilling demands Cost-savings, agility (Bieberstein, Sanjay, Fiammante, Keith, & Shah, 2009)
Continuous improvement, learning	KAIZEN	ITIL or CMMI SVC recommendations	Training costs are proportionate to the expected result. The gained knowledge shall be shared, but its inclusion in the processes of the organisation faces cultural limitations.	Innovation Cost-savings Sharing knowledge

During the survey we applied the 6-level Likert scale, and we ignored the answers with a variation exceeding the value of 1.5 or those that did not lean to any direction on the scale. The composition of the research sample is shown in the below figures.

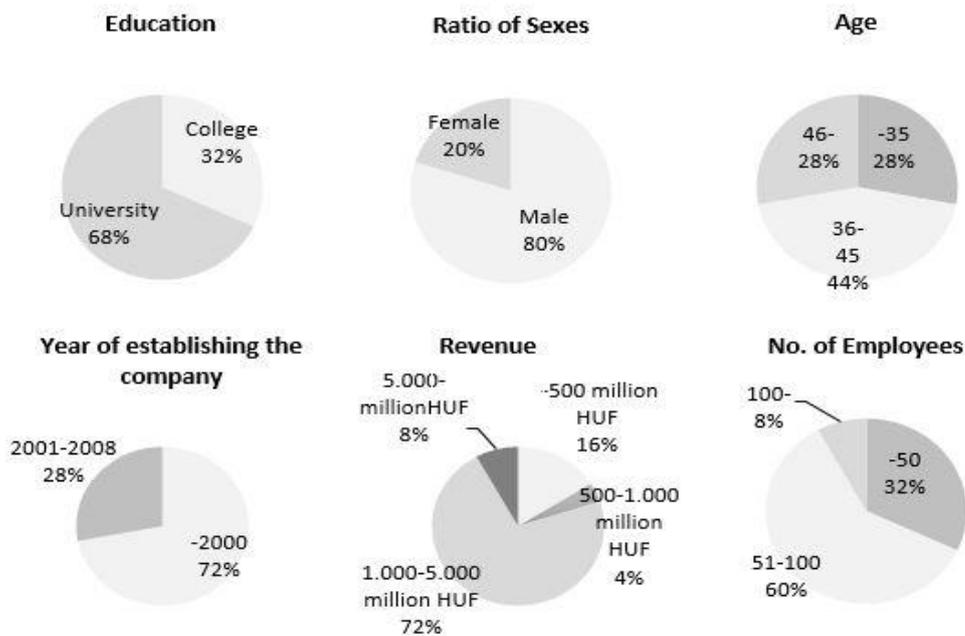


Figure 4. Profile of managers participating in the research

9. Summary

In the above paper I have briefly presented the applicability of LEAN tools - which are widely used in production management - in the field of IT services, highlighting the specific field of development. The undertaken research clearly shows that our main suppliers would increase iterativeness during their operation, but it is sometimes hindered by certain limitations.

Our own experience also supports the above statement. As a service provider, we would also require more flexibility and iterativeness in our development processes, however as a customer it is hard to accept. Obviously, we also understand that during the application of the waterfall model, it is quite a challenge to manage risks, observe budget limitations and to deliver quality products (Nabil Mohammed Ali & A., 2010), yet the change is still to come. In our opinion, the most reliable results during the introduction of a system can be introduced, if the minimum contents of allowing the live start of the system with a fixed scope are successfully defined, and further demands are included later, based on a more flexible approach, through

continuous development. The application of virtualization techniques and monitoring systems is widely popular, but the advantages of the SOA are yet to be seen. In this field, the biggest challenge is having to teach participants not to think in IT systems, but in corporate, business and IT architectures.

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Competence Utilization for Innovation Capabilities – A Question of Trust?

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The purpose of this paper is to show how trust as an organizational value contributes to employee competence utilization in the case of innovation capability. Thus, it is the objective of this paper to analyze the positive impacts, but also potential limits of trust in business management. The research paper uses two different quantitative empirical studies drawn from German and Austrian mid-sized companies to empirically test this interrelation. As a result, the paper determines particular aspects of trust such as accountability, shared norms and the ability to take responsibility to be interrelated with the usage of employee competences and underlines a positive connection between product innovation performance and trust. However, the trust concept needs enriching elements to be balanced towards a feeling of mutual reliance and support creativity instead; inclusions of bridging social capital, elements of distrust and a pioneering spirit are to be mentioned here.

Keywords: Trust, employee competence utilization, innovation, creativity

JEL Classification: D23, D83, L22, L25, M11, M14, L20, O30, O31, O32, O34

1. Introduction

Scientists have elaborated on a wide range of ideas on innovations related to different influencing variables in companies (Medina et al., 2005). Still, innovation in itself is mostly unique, which is the reason why an entirely valid model for fruitful innovation has not yet appeared (Delbecq and Mills, 1985). To manage all the influencing factors, which, generally, can be classified into factors from the general environment, the competitive environment, and the company environment becomes increasingly important for managers. With limited budgets, the question arises where to focus on and how to enhance innovation capabilities without

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Article History:
Received 29 April 2015 | Accepted 15 May 2015 | Available Online 29 May 2015

Cite Reference:
Bolzern-Konrad, B., Egger, C., and Šumilo, Ě., 2015. Competence Utilization for Innovation Capabilities – A Question of Trust?. *Expert Journal of Business and Management*, 3(2), pp.90-104

having above-average financial resources. And, even if financial resources are available, research shows that this alone does not make innovation an automatic outcome at all, either. Despite the importance generally attributed to soft organizational factors such as organizational values for innovation, empirical research remains somewhat limited. Particularly the interrelations of trust as an organizational value, and how it contributes to the utilization of employee competences with special regard to innovation has only received scarce treatment so far. Therefore, the research paper at hand makes a first approach to fill in this gap. **The major research question involved can be phrased as follows: How does trust as an organizational value contribute to employee competence utilization in the case of innovation capability?**

First, a theoretical framework of employee competence utilization, trust, and its impact on innovation is built. On the basis of two empirical studies in German and Austrian mid-sized companies, the positive impact of different aspects on particular innovation performance outcomes is determined. This leads to a discussion of the empirical results and an overall validation of the propositions that the authors put forth. Finally, the end of the paper shows limitations, conclusions and suggestions for further research.

2. Literature Review: A Theoretical Framework of Trust, Employee Competence Utilization and Innovation

2.1. The Capability to Develop Innovative Ideas as Part of a Universal Competence Portfolio

In order to approach the aspect of competence utilization, the concept of competencies itself has to be understood first. With the historical development of the competence definition in mind, the discussion debate has moved from a purely individual perspective to one focused on social systems and organizations (Bolzern-Konrad, 2013). Furthermore, for both individual and organizational levels of competence, the research has moved from a more stability-oriented view to a dynamic view (Eberl, 2009). Especially in the frame of education science Weinert (2001) gives an important definition on competencies: “competencies are cognitive skills, either existing or learnable, along with motivational and social willingness and ability to solve these problems successfully and responsibly in various situations (HRK, 2012).” Reflecting on the individual competence understanding, and with this linking back also to the psychological and educational perspective, Eberl subsumes in another work, that the connecting bracket has to be seen in three basic bonding elements: the emphasis on practice, the self-organization-disposition thought and the relevance of learning. The emphasis on practice requires effective action that delivers positive, usable results. Further to this, if competencies cannot be demonstrated competence reduction is the result on a long-term perspective. The self-organization disposition is related to qualitative aspects like skills and knowledge as well as motivational skills such as motives, norms and attitudes. It also includes the element of self-directed solutions. The learning dimension covers the aspect of self-directed continuous extension of knowledge and ability (Eberl, 2009). These elements are comparable to the description of competencies by Erpenbeck and Rosenstiel (2007). Their understanding of competencies incorporates a meaningful and fruitful action in open, complex, sometimes even chaotic situations that allow self-organization under theoretical and actual insecurity through self-accounting rules, norms and values. According to their model, competencies include skills, knowledge and qualifications, but cannot be reduced to it. Competencies additionally need the capacity to act in open unsecure complex situations based on self-made rules, norms and values. Therefore competencies are dispositions of self-organized action, including informal and self-organized learning (Erpenbeck and Rosenstiel, 2007). The aspect of self-organized learning is directly linked to innovation capability.

The individual perspective can neither be seen as isolated, nor as organizational competencies, which should be seen separately from the organizational perspective. In this sense individual competences generate in its combination sustainable success for the company, with organizational competencies being a product of competent individuals in addition (Eberl, 2009). In her model of organizational competencies Eberl specifies organizational competencies towards three dimensions: the cognitive, the practical and the affective. The cognitive dimension refers to “sense models”. This dimension incorporates the organization’s “view on the world” and can be allocated in the field of organizational culture. The practical dimension refers to “patterns of action” and is defined through collective, complex schemes of action. The affective dimension refers to creativity and motivation in insecure environments (Eberl, 2009). The capability to develop innovative and creative ideas is thus a central part of the universal competence portfolio, based on self-organization and affective processes. Particularly the affective dimension also reflects the aspect of willingness; an essential aspect when touching on competence utilization. Competence-in-use is based on a sufficient level of ability, but necessarily needs the element of willingness as well. Referring to the situational leadership model of Hersey and Blanchard (1974), the maturity level of an employee equates to their development level. They further explain that the developmental level is the degree of competence and commitment a person has, to

perform a task without supervision. With competence referring to the aspect of general given ability, commitment refers to achievement-motivation and willingness (Hersey and Blanchard, 1974). Further to this, Schmitz (2005) introduces another illustration reflecting the concurrence of motivation and ability. Whereas ability and skills can be assessed mainly through employee selection and throughout the process of employee development, the element of willingness is essential in order to achieve the utilization of abilities and skills resulting in positive performance (Schmitz, 2005). Integrating these ideas towards the concept of “ability in use” the first author developed a model for employee competence utilization shown in figure 1 (Bolzern-Konrad, 2013).

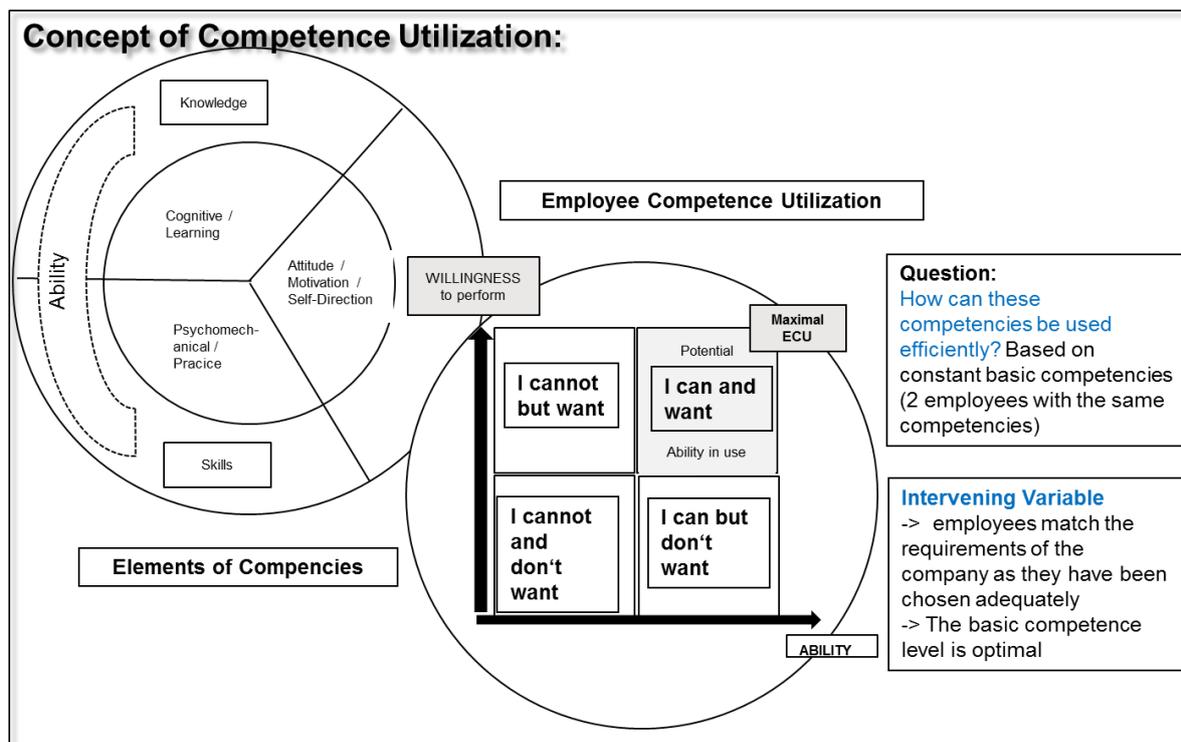


Figure 1. The research concept of competence utilization

Source: Britta Bolzern-Konrad, based on Eberl (2009), Hersey and Blanchard (1974) and Schmitz (2005)

In order to make the capability of innovation to the subject matter the affective dimension of individual competencies moves to the focal point and will be reflected further to the universal competence concept shown here.

2.2. Trust as an Organizational Value Enhancing Innovation

An organizational value closely linked to innovation performance is trust. With a higher level of trust, employees might contribute to innovative ideas to a higher extent (Hosmer, 1995). Feeling trusted makes people brave enough to undertake a risky course of action, because they are confident that all persons involved will act competently and dutifully (Barber, 1983 in: Lewis and Weigert, 1985). Leaders are not only responsible for providing a safe environment where trust and candor are highly valued. They also have to show versatility and foster innovative ideas among their followers (Agin and Gibson, 2010). Taking this as a background, it comes as no surprise that numerous other authors state trust to be an innovation-supportive value. For Jassawalla and Sashittal (2002), all participants of an innovative organization are seen capable of being trusted in innovative companies. Additionally, they feel comfortable when they have to seek for clarifications and are willing to make themselves exposed to other members' criticism. On the contrary, for these authors less innovative organizations are full of distrust, lack of confidence in others, and paranoia (Jassawalla and Sashittal, 2002). Clegg et al. explicitly research implicating trust in the innovation process. The authors argue that if people trust that their ideas will be heard and taken seriously and that they will benefit themselves from idea suggestions they are more likely to participate in innovation processes (Clegg et al., 2002). Ellonen et al.(2008) critically emphasize that the role of trust in organizational innovativeness lacks empirical research. However, the authors assume that there is a clear interrelationship between high levels of trust and its impact on effectiveness, knowledge sharing and innovation (Ellonen et al., 2008). Even in the

1960s, Lorsch and Lawrence claim mutual trust and confidence to be decisive requirements for product development (Lorsch and Lawrence, 1965). More recent authors transfer that to an emotional context. For creative actions members of an organization must feel emotionally safe (Martins and Terblanche, 2003). Moreover, successful innovation can only arise when accompanied by a cultural setting that promises emotional safety when experimenting new ways of solving old problems (Eigenstetter and Löhr, 2008). Various authors also mention other related topics to trust such as friendship (Eigenstetter and Löhr, 2008), togetherness (Anonymous, 2010) or a sense of sharing (Ahmed, 1998) when it comes to the development of new concepts. In summary, trust must have a high impact on product innovations. Trust is mentioned unambiguously so frequently by different authors that it undoubtedly must play an essential role as an organizational value for product innovation.

2.3. The Concept of Trust as Part of Social Capital

Adler and Kwon state that there is a basic consensus that social capital derives from relationships (Adler and Kwon, 2002). Whereas the knots of a network structure constituted by individuals symbolize human capital, social capital is located in the relationships of this network. That is the complementary view Coleman has taken (Coleman, 1990). The premise behind social capital is rather simple and straightforward; social capital is an “investment in social relations with expected return” and therefore investing in relations leads to the opportunity to re-gain capital (Lin, 1999). The perspective on social capital moves from social disparity towards a new source for organizational advantage. This advantage is reflected in the utilization of unused potential (Moldaschl, 2009) in a sense that it gives actors the opportunity to use and activate resources otherwise not available or available at greater cost (Baumane and Sumilo, 2007). Further to this, core aspects of social capital can be identified independently of their theoretical background; these are the aspects of networks, trust and reciprocity (Putnam, 1995). The network notion is also pictured in the discussion about bonding and bridging social capital. Bonding social capital is positioned on the micro level based on the interrelation of individuals within a group strongly driven by trust and reciprocity. As Baumane and Sumilo underline, it is rooted in and developed within established homogeneous social system and is not shared between outsiders. As a result they come to the conclusion that bonding social capital is advantageous for preservation of existing resources. This further leads to the indication that the strong forms of bonding social capital might have negative impact on innovation and effectiveness of group work (Baumane and Sumilo, 2007). Also Steinfield et al. indicate that the bonding form of social capital functions strongly integrative as it is based on a high level of trust and reciprocity. Within an organization this concept may be associated with feelings of social and tangible support (Steinfield et al., 2009). At the same time reciprocity reduces by nature the degree of freedom (Hellmann, 2008), which supports its imaginable limiting effect on innovation and creativity mentioned before. In the words of Modaschl: ‘any relation does not only offer opportunities, but also binds’ (Moldaschl, 2009). Bridging social capital is defined as the crosslinking between networks, which opens the view to the macro perspective (Hellmann, 2008). It is based on relations between distant acquaintances connecting people from different social groups facilitating flows of information and influence. Therefore it is related to network ties between actors from otherwise disconnected groups, which is the reason that Steinfield et al. argue that these large networks are more likely to include ‘weak ties’ (Steinfield et al., 2009). As a consequence Baumane and Sumilo state that bridging social capital is more appropriate for search and acquisition of new resources (Baumane and Sumilo, 2009). Nevertheless it can be imagined, that both notions are relevant for organizations. As Steinfield et al. accentuate the concept of social capital has achieved extensive treatment in organizational literature, with both constructs of bonding and bridging social capital being relevant in organizations. They also stress that bonding social capital in an organization implies that there is trust and sense of obligation that encourages reciprocity, while bridging social capital is associated with the kind of weak ties that facilitate access to non-redundant or innovative information (Steinfield, 2009). To sum up, social capital is a resource that is inherent in relations and based on the assumption that the other person or institution justifies trust and in return probably acts reciprocal (Haug, 1997). Within this definition trust is seen as a basic element (Bolzern-Konrad, 2013).

Comprising different definitions, having further the trust quality levels in mind and finally not forgetting the social capital context, the following elements are evaluated to be decisive in an organizational environment: Trust derives from relationships and is defined as the willingness to be vulnerable in a complex uncertain situation dependent on another person. It is based on a positive expectation on mutuality and results in risk taking decision and action. Referring to the basic benefit of social capital this risk taking action implies the potential to utilize unused resources. Therefore the trust-based-action implies the potential to realize unused resources (Bolzern-Konrad and Sumilo, 2014b). Notably risk taking plays a central role in the concept. High-level trust is based on a risk assessment vindicated by experience derived from time invested in relationships

(Dietz and Hartog, 2006). Repeated behavior and shared values are not only an expression of individuals but they also contribute to the reputation of the organization as a whole; an additional aspect pictured in Luhmann's concept of system trust (Bohn, 2007). It also opens the way for trust correlates. This is because system-trust brings rational elements back into the picture. Luhmann does mention system-rationalization in this sense (Luhmann, 2014). In order to remain open to changes and renewable some systems need strong inclusions of distrust. In this way distrust is used to prevent a diffuse feeling of 'mutual reliance'. Luhmann further states, that on the one hand distrust can be an origin for inner organizational conflicts, especially if it is not specified and impersonal, but as regards to innovation for example distrust is seen as a necessary tool (Luhmann, 2014). This perspective has been taken also from other researchers. Lewicki et al. even propose a theoretical framework for understanding trust and distrust simultaneously within relationships. They state that trust and distrust both entail certain expectations; but whereas trust expectations anticipate beneficial conduct from others, distrust expectations anticipate injurious conduct. Although defining trust and distrust as being reciprocal, they view them as separate and distinct constructs (Lewicki and McAllister, 1998).

Trust can be conceptualized within organizations, between organizations and towards the organization. The individual in the organization develops trust towards individuals, groups, or organizations. At the same time organizations are mostly represented by humans. For this reason the argumentation is that both personal trust and organizational trust mechanisms are to be considered (Rupf-Schreiber, 2006). Following the analysis given before and based on a combined view of interpersonal and organizational trust perspectives the first author has developed the concept of trust shown in figure 2.

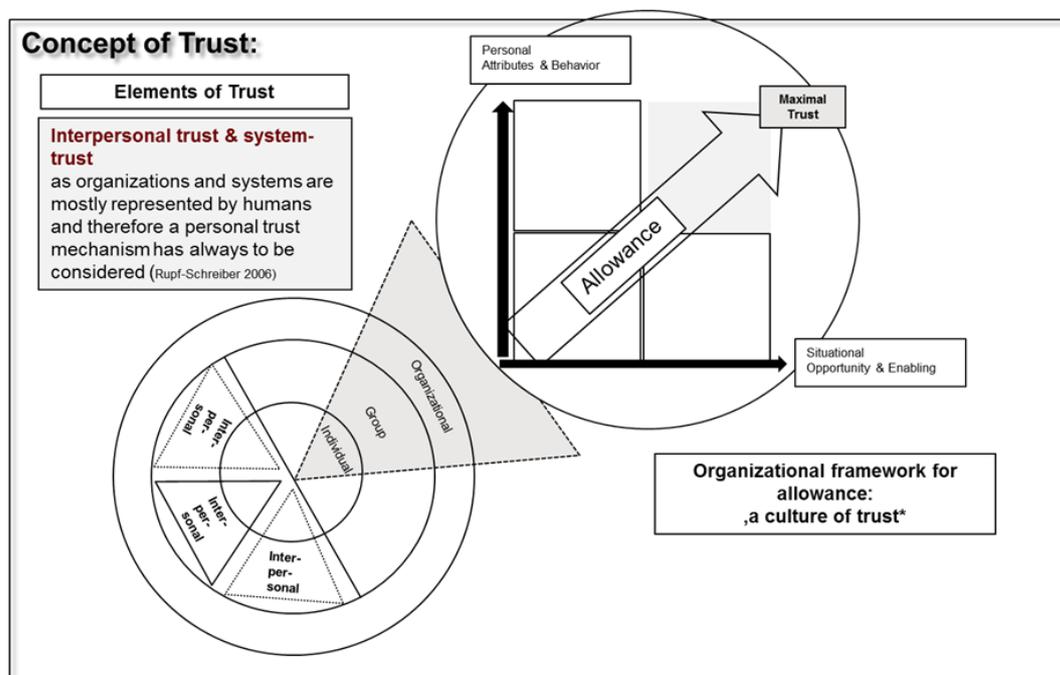


Figure 2. The research concept of trust

Source: Britta Bolzern-Konrad, based on Luhmann 2007 and Rupf-Schreiber 2006

3. Research Premises: Combined Illustration on Trust within the Field of Other Organizational Values and Innovation Capability within the Concept of Competencies

Based on this theoretical background, the authors developed the following combined illustration of both the concept of trust within other organizational values and innovation capability within the concept of competencies as shown in figure 3.

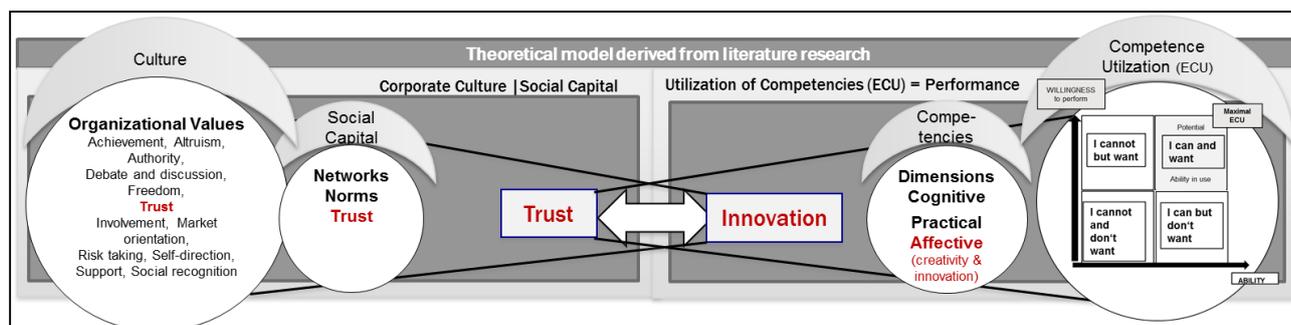


Figure 3. Model on the interrelations of trust and innovation as a dimension of employee competences
Source: Bolzern-Konrad and Egger, 2014

This model shows how all topics addressed above are interlinked. Innovation and creativity form a major component of employee competence utilization concepts, which in the end try to suggest possibilities how to make employees perform better. Organizational culture mostly comes down to values and trust is a major component here, which is repeatedly mentioned when it comes to innovations. For this reason, the authors see a very strong connection between both backgrounds that is further substantiated by the following findings.

Overall, the authors put forth the following two propositions:

1. **Trust as an organizational value positively impacts on employee competence utilization in general.**
2. **Trust positively affects innovation outcomes in business companies.**

Additionally, the authors phrase the following research question to their combined study: **When it comes to innovation capability, is endless trust the only organizational value of choice, or is there potential limits to its occurrence?**

4. Research Methodology and Data

This paper shows two empirical studies that used various different research methods and instruments. Further, they used different samples to gain results from, which are explained in the following subchapters.

4.1. Study 1: Trust and Employee Competence Utilization in German Mid-Sized Companies

The basic methodology of this research work follows a pragmatic approach. On the basis of two pre-studies the decision was made to base the pre-selection of companies for the main empirical study on a qualitative approach. Companies finally involved in the main study were well-defined and selected. A major criterion was the involvement in a particular business-excellence-circle. Branches were distributed in the fields of Medical, Fibers, Metal, Furniture, Telecommunication, Mechanical Engineering and Safety Systems (Bolzern-Konrad and Sumilo, 2014b). As a result a sample of 206 employees constituted the correlation analysis between the indicators of trust and the indicators of employee competence utilization. This number comprises of 20-50 employees from each of the six companies finally involved. A written online self-completion questionnaire was the preferable instrument of data collection. The questionnaire consisted of closed questions using 5-point Likert-scales. All data were analyzed with the statistical software of IBM SPSS 21. The survey took place between March 2014 and August 2014. For the research study the concept of trust builds the central point. The following variables were used for the execution of testing.

Independent variable: Trust is a latent variable. Measurable indicators were defined as: Fairness (TF), Clear Goals and Transparency (TC), Network Structure (TN) and Delegation level (TD).

Dependent variables: Employee Competence Utilization also is a latent variable. Measurable indicators were defined as: Retention (ER), Over obligatory Performance (EO), Productivity per employee (EP) and Satisfaction level (ES).

4.2. Study 2: Trust and Product Innovation Performance in German and Austrian Mid-Sized Manufacturing Companies

The research design chosen for the second study presented here is a quantitative cross-sectional, correlational one with the organization as level of analysis. The original, main purpose of this study was to research the impact of different organizational values on product innovation outcomes. All sample companies had to accord with the industry sector of manufacturing companies, respondents had to be in management

positions with a task relevant to product development and innovation. To begin with, the standardized online questionnaire clarified the main terms of the research – organizational values and product innovation. In the following, the online questionnaire mainly consisted of closed questions using 5-point Likert-scales. All data were analyzed with the statistical software of IBM SPSS 21. The survey took place between February 25th, 2014 and April 25, 2014. On the whole, 81 respondents from different German and Austrian industrial companies took part in the survey. In general, these companies stated to be rather large (more than 250 employees), rather internationally active (at least all across Europe), and rather innovative compared to their industry competitors. All data were checked for normality with Kolmogorov-Smirnov-Tests and all significance levels lie below .05. Therefore, non-parametric tests are used for further analysis. The following variables were used for the execution of testing.

Independent variables: 12 organizational value themes, namely achievement, altruism, authority, debate and discussion, freedom, involvement, market orientation, risk taking, self-direction, social recognition, support, and trust. These value themes resulted from an intense content analysis of 40 previous studies regarding organizational values and innovation performance (for further details see Egger, 2014a). Generally, they were measured first in terms of how much they are important to product innovation, secondly, in terms of how much they are characteristic of the managers’ organizations. The meaning of each value theme was explained in detail in accordance with other measurement instruments of values.

Dependent variables: 6 product innovation performance indicators, namely the number of new products introduced, the pioneer disposition to introduce new products, the clever response to new products introduced by competitors, financial efforts to develop new products, additional efforts to develop new products in terms of hours per person, teams, technology and training involved (in accordance with Naranjo-Valencia et al., 2011; Naranjo-Valencia et al., 2010), the speed of new product development (NPD) (in accordance with Prajogo and Ahmed, 2006). Here, enterprises had to evaluate their innovation performance against industry competitors in the past three years in order to limit industry effects.

5. Analysis and Results

The following section shows the results of each study. For both studies, correlations, coefficients of determination and in some cases regressions were calculated. The chapter also combines the results of both studies in the last section.

5.1. Study 1: Trust and Employee Competence Utilization in German Mid-Sized Companies

Being founded on a sample of 206 questionnaires the hypothesis “**the higher the level of (perceived) trust, the higher the level of employee competence utilization**” was not falsified. To explore the correlation between variables, Spearman’s rho as the nonparametric measure of choice was assessed. As a result the dependence between trust and ECU is $0.455 = r$. As a second measure to assess the impact of trust on employee competence utilization, the coefficient of determination r^2 was examined. As a result r^2 is 0.202 with a significance level of 0.01 two sided. Accordingly, a positive connection between trust and employee competence utilization outcomes can be underlined in saying that trust has an impact of 20% on changes in employee competence utilization.

Table 1. Correlation between Trust and Employee Competence Utilization (ECU)

Correlation Trust/ECU Employee = 206	Correlation r (Trust/ECU)	Coefficient of Determination (r ²) (Trust/ECU)
Spearman-Rho	0.455**	0.207**

** . The correlation is on a level of 0.01 (2-sided) significant

Source: Survey results

This result is traceable with the theory background as well as with the specific organizational environment in mind. Even if a 100 percent trust level might be regarded as a desirable goal with respect to the resulting potential realization, it may neither be assumed nor should be sought. Not only that theoretical results have shown that trust never can be the only impact factor, results have also shown that elements of control and distrust should always be involved in order to avoid blind trust. Further to this strategic management is embedded in internal and external factors, influenced by macro- and microenvironment. Here to name the competitive environment, basic technological developments, new substitution products in the field on the macro level, and even more employees’ qualification level, process technology, the organization’s structure and systems in place on the micro level, are expected to significantly impact the “ability in use”. As

a consequence a level of 20 percent being the outcome of the empirical study might not be unrealistic in terms of relative influence weight. Overall, proposition 1 is highly substantiated with this finding. Moving one step further and deepen the level of analysis the different indicators for trust respective employee competence utilization have been analyzed as regards to their correlation.

Table 2. Coefficient of determination of all indicators for Trust and all indicator s for ECU based on the authors model on level 2

Coefficient of Determination (r^2) based on Spearman-Rho Employees n=206	Overobligatory Performance (EO)	Satisfaction Level (ES)
Fairness (TF)	0.38**	0.58**
Clear Goals and Transparency (TC)	0.41**	0.47**
Network Structure (TN)	0.19**	0.29**
Delegation Level (TD)	0.33**	0.46**

** . The correlation is on a level of 0.01 (2-sided) significant
Source: Survey results study 1

As a result all elements of trust show a significant correlation to employee competence utilization. Though, fairness and clear goals show the highest results with regard to the correlation to employee competence utilization. Fairness even shows a correlation towards satisfaction of 58 percent. This might be explainable do to the fact that fairness also includes additional elements like failure culture and justice. Clear goals show a correlation towards over obligatory performance of 41 percent. Both results particularly catch to the eye towards the correlation of trust elements with over obligatory performance and satisfaction. These two elements of employee competence utilization incorporate essentially the aspects of commitment and engagement and meaningfulness, motivation and growth perspective. Having seen that especially fairness and clear goals correlate specifically high with over obligatory performance and satisfaction it is of interest to deepen the level of analyzes further.

Table 3. Coefficient of determination between specific indicators of Trust and specific indicators of Employee Competence Utilization (ECU) on level 3

Coefficient of Determination based on Spearman-Rho (r^2)	Commitment (EOC)	Engagement (EOE)	Intrinsic Motivation (ESI)	Growth Perspectives (ESG)
Accountability (TFA)	0.35**		0.42**	0.30**
Accepted Goals (TCA)		0.23**		0.36**
Shared Norms (TCS)	0.36**			
Communication (TNC)			0.34**	
Ability to take responsibility (TDA)			0.48**	

** . The correlation is on a level of 0.01 (2-sided) significant
Source: Survey results study 1

Summarizing on these results it can be stated that indicators such as accountability, shared norms, open communication, delegation and empowerment are strongly interrelated with the usage of employee competences. Particularly the accountability of the trustee as well as shared norms and accepted goals between trustor and trustee show the highest correlations with specific indicators in the employee competence utilization field. Here to be named commitment, intrinsic motivation and growth perspectives. But it has to be emphasized that especially the ability to take responsibility correlates significantly with 48 percent to the trustor's intrinsic motivation. Thus it can be assumed that a situational context that allows freedom in decision and action motivates employees intrinsically; the work content itself, as well as the takeover of responsibility are to be named as essential elements of the intrinsic motivation in this context. Commitment and motivation are thus very close, especially as motivation is seen as a factor of affective commitment being responsible for high retention of employees. Shared norms and accepted goals are also of high impact as regard to commitment (Morrow, 1993). Interpreting these results, shared goals obviously lead to focused behavior and an alignment of the individual goal plan with the company's expectations on the same; an effects that supports a strong feeling of satisfaction, incorporating the growth perspective in the scope of the author's model.

Putting the subject matter towards innovation results are interesting. Being part of the concept of competencies, innovation is especially exposed to creativity and knowledge.

P2: The higher the level of trust, the higher the level of innovation

Approaching the capability of innovation within the concept of competencies trust had been analyzed against specific innovation. The analysis was based on the underlying Question: Would you say your company is innovative? Results are shown in table 4.

Table 4. Coefficient of determination between the indicators of Trust and Innovation

Trust Indicators	Innovation (r²)
Fairness	0.20**
Clear Goals	0.26**
Network Structure	0.11**
Delegation level	0.12**
Accountability	0.21**
Shared norms	0.22**

** . The correlation is on a level of 0.01 (2-sided) significant

Source: Survey results study 1

Touching on the special aspect of innovation, results allow the interpretation that, trust positively impacts innovation. The highest correlation level can be found between aspects of fairness, especially accountability of the trustee and clear goals, especially sharing of norms. As mentioned before, innovation captures a special attention within the competence concept used in the research study. Being part of the creative dimension and touching the knowledge content of competencies, innovation is supported by high levels of trust, as trust reduces insecurity and risk and thus provides an atmosphere supporting creativity. On the other hand, innovation needs specific forms of institutionalized distrust to function and avoid lock-in effects and the development of blind and non-reflected trust. This aspect might explain that factors referring to personal characteristics like the accountability of the trustee promote innovation (21%), whereas factors like strong internal bonding network ties show lower correlations (network structure, TN =11%). The highest values of correlation towards innovation can be found in the element of shared norms; obviously a clear articulation and a common basis of norms and goals provides sufficient security to think and act innovative and at the same time still allows the orientation to partners outside the company triggered by bridging social capital. This fits to the finding in the theoretical part, that bridging social capital is reliant on certain independence with respect to internal networks in order to be free to go in contact to external partners. These findings are also underlined through the analysis of trust specific situations. These so called ‘trust-vignettes’ had been developed in the course of pre-studies and were evaluated in their correlation to competence utilization. Particularly the ‘allowance of constructive and seriously taken criticism’ explains 11 % of the changes in employee competence utilization; a situation that touches the aspect of fair treatment. Referring to the same topic, the ‘way of dealing with failures’ also takes an important role in terms of trust-specific situations (9%). Thus, proposition 2 must be seen as valid so far.

5.2. Study 2: Trust and Product Innovation Performance in German and Austrian Mid-Sized Manufacturing Companies

As outlined, this study researched the impact of organizational values on product innovations. The following part particularly looks into the interrelations of trust and product innovation performance. To explore the dependence between the variables, Spearman’s rho as the nonparametric measure of choice was assessed. To use comparable measurement units, the following variables were used: managers’ answers to the question on how much trust is characteristic of their organization and answers to the subjective self-evaluation of innovation performance. In fact, trust proves to have a positive correlation with the speed of new product development (rs = 0.241, p = 0.032). Thus, trust explains some 5.8% (rs² = 0.058) of the variance here. This is comprehensible, since for very challenging schedules in new product development shortcuts need to be taken sometimes, which includes the acceptance of ambiguity and the general trust in oneself, the organization and in the expected outcome (a similar result was discussed in Bolzern-Konrad and Egger, 2014; Egger, 2014b).

As a second measure to assess the impact of trust on product innovations the coefficient of determination was examined. For this, a linear relationship between the independent variable of trust as a value theme and the dependent variables was assumed in order to calculate a regression analysis. For the research at hand, the parameter of relevance is the coefficient of determination, R Square (R²). Thus, to explore how much the value theme of trust explains the variance in innovation performance outcomes a linear regression for all subjective innovation criteria was run. Table 1 shows the adjusted coefficients of determination for the self-

evaluated performance indicators against competitors with the level of trust as a characteristic of the manufacturing companies involved.

Table 5. Adjusted coefficients of determination for dependent variables

Innovation performance against competitors for...	Adjusted R²
Number of new products	0.044
Pioneer disposition of new products	0.003
Speed of new product development	0.042
a. Predictors: (Constant). Level of characteristic Trust	

Source: Survey results study 2

Accordingly, an impact of the trust value theme on product innovation is determined in this study. 4.4% of the variance in the number of new products and 0.3% of the variance in their pioneer disposition are explained by trust. Further, trust explains an interesting 4.2% of the variance in the performance indicator of speed in new product development. Clearly, the models are rather volatile when checking the standard error of the estimate (see Appendix for details), but, of course, it is clear that innovation outcomes do have many influencing factors relating not only to the soft factors within a company, but also to budgets, know-how, or even the macroeconomic and the competitive environment. Expecting really high coefficients of determination would not be very reasonable here. However, these coefficients of determination state the size of the positive impact that trust has on product innovation outcomes and show that the value theme is particularly relevant for the number of new products introduced to the market and the speed of new product development. Again, this strengthens the authors' second proposition.

To prevent several values from measuring a similar phenomenon in this study an iterative, rotated principal component analysis was performed with the full data set of independent variables (for detailed analysis compare Egger, 2014b). Managers had to rate how important they find each value theme for product innovation outcomes and it was assumed that there could be correlations between two or more of the independent variables. The analysis results in four major components that explain around 57% of the variance in values. Table 6 displays the results.

Table 6. Rotated component matrix: Evaluated importance of values

	Component			
	1	2	3	4
Social recognition	0.789			
Self-direction	0.618		0.308	0.373
Altruism	0.597			
Trust	0.544			-0.303
Support	0.478	0.408		
Involvement		0.664		
Achievement		0.661	0.320	
Market orientation		0.637		0.483
Authority		0.564		
Risk taking			0.823	
Freedom	0.353		0.662	
Debate and Discussion				0.841
Cumulative total variance explained	17.66%	33.66%	45.95%	56.99%
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 7 iterations.				

Source: Survey results study 2

Obviously, in the first component, the value theme of trust is accompanied by several additional values such as social recognition, self-direction, altruism, and support. Reflecting the contents of these value themes, this component undoubtedly can be seen as the soft enablers of product innovation around trust and encouragement. The second component summarizes performance aspects necessary for innovation accompanied by involvement, while the third component highlights a risky, inventive pioneering spirit to be essential. Interestingly, trust shows a negative loading on the last component. Debate and discussion make up an entire single factor here. Accordingly, it must be admitted that managers find questioning, critical awareness and a variety of viewpoints fundamental. Since market orientation shows the second highest loading on this last component, it is assumed that managers find debates that are driven by market orientation most precious for product innovations. Apparently, too much trust would hinder fruitful and honest debates and discussions,

since it might make people too blind to challenge colleagues and leaders in order to ensure the best solution to a problem.

Thus, for successful product innovations, trust alone is not enough. Instead, there can even be situations where too much trust hinders it, which is the reason why it needs to be completed by additional value themes such as achievement and critical debates and discussions to enhance innovation capability. This gives a first indication for the additional research question that the authors phrased above.

5.3. Combined Results of the Two Empirical Studies

As an intermediate conclusion, this section determined the following empirical results. In general, trust shows a positive impact on the utilization of employee competences. In both studies, different aspects of trust correlate positively with innovation outcome indicators. Further, it explains an interesting amount of the variance in innovation performance and thus, its positive connection can no longer be denied. However, both studies brought to light that other aspects are needed for innovations as well. The next section further discusses these insights.

6. Discussion and Conclusion

It was the purpose of this paper to show how trust as an organizational value contributes to employee competence utilization in the case of innovation capability. In this paper, it was outlined, that a universal competence portfolio includes the capability to develop innovative ideas, for which in turn organizations need trust. Trust itself can be seen as embedded in the idea of social capital and surely is a multifaceted phenomenon in itself.

6.1. Theoretical Contribution

With the intention to give answers to the propositions made upfront results are discussed and evaluated towards their implications and limitations.

1. Trust as an Organizational Value Positively Impacts on Employee Competence Utilization In General

Overall, it can be stated from this research paper that trust as an organizational value highly contributes to the utilization of employee competences, specifically when it comes to innovation capabilities. Thus, it is an aspect of major managerial importance. Trust within the concept of social capital is able to gain an effect that would not be possible based on pure control. This is possible because in a culture of trust we are able to accept risk. Furthermore and being related to the first study, the results particularly show a high correlation of trust towards over obligatory performance and satisfaction.

2. Trust Positively Affects Innovation Outcomes in Business Companies

Although the literature on success factors for innovation comes up with a very diversified number of organizational values, these ideas can be limited to four major aspects according to this study: trust and encouragement, intrinsically motivated performance, pioneering spirit, and market-driven debates and discussions. Even if this sounds contradictory at first sight, it perfectly accords with Khazanchi et al.'s findings on the impact of organizational values on process innovation revealing both, flexibility and control values (performance values), to be decisive, because control values enable flexibility values (Khazanchi et al., 2007), respectively performance and market orientation enable trust and pioneering spirit. Being related to the first study innovation captures a special attention within the competence model being part of the creative dimension. Results have shown that especially factors referring to personal characteristics like the trustee's accountability promote innovation whereas factors like strong network ties, especially internal bonding ties show lower correlations.

Regarding the additional research question **“When it comes to innovation capability, is endless trust the only organizational value of choice, or is there potential limits to its occurrence?”**, the authors argue the following:

It needs to be declared that trust shows an inconsistent picture: when it comes to debates and discussions, trust shows a negative relationship. One could even argue that sometimes in innovations, “distrust” is needed to push people to better performances and question the solutions that they have already found. In order to ensure diverse viewpoints, critically question the status quo and challenge easy explanations, too much trust and cosiness can be counterproductive. Instead, managers should never sacrifice the target of striving for peak performance and innovative solutions to a friendly, trustful atmosphere. In summary, the general recommendation for managers to “deal with the people as human beings, but with the problem on its merits (tough with the issue, but soft with employees)” (Fisher et al., 2011) must be underlined here. These results

reflect on the particular character of trust being analyzed in detail in the first study. The results of the first empirical study have shown, that a situation referring to seriously taken constructive criticism, as well as the aspect of failure handling show high correlations to employee competence utilization. Especially these two elements incorporate aspects of institutionalized distrust. Thus it can be assumed if distrust is institutionalized it might be even recognized as a trustful atmosphere. Especially innovation needs specific forms of institutionalized distrust in order to avoid lock-in effects and the development of blind and un-reflected trust. As a conclusion the authors see trust as a very complex phenomenon that has to be institutionally anchored, but also includes a healthy level of distrust in order to enable constructive criticism and critical awareness of many different viewpoints.

6.2. Managerial Implications

This research points to various interesting implications for business managers. Firstly, the theoretical framework elaborated here, reminds us that trust as an organizational value and institutionally anchored not only is a complex phenomenon, but also shows various positive effects regarding employee performance and organizational outcomes. Therefore the positive impact of trust on employee competence utilization needs top management attention. The actual environment organizations live in however creates challenging requirements on the personal characteristics, relational abilities and contextual behaviors of managers which are important to establish frameworks that allow the realization of its employees' competencies and with this contribute to the success of the organization. Thus, it comes as a leadership challenge to set up companies accordingly. Secondly, although correlation does not necessarily prove a cause-effect-relationship, it provides strong evidence for it, which is substantiated by the theoretical background provided in this paper. Therefore, managers must realize that employees need appropriate organizational backgrounds that go far beyond financial resources in order to develop innovative ideas. Further, there is also the need to reconsider relationships with other stakeholders beyond company boundaries, such as suppliers, financial institutions, customers, or research laboratories. Again, using trust in bridging capital does support innovation performance. For this reason, treating suppliers as equal partners and working on trustful, long-lasting relationships with them rather than pushing them down in prices until they struggle for existence, for example, comes as a necessary success factor. On the other hand, managers must work on the right balance between trust, constructive distrust and performance aspects. Thus, business companies need to train managers much more in leadership capabilities. Further, top management has to ensure appropriate time frames, trainings on-the-job and even mentoring programs to ensure that leaders can actually work on the appropriate environment compiling trust as an organizational, institutionally anchored value.

6.3. Limitations of study / Future directions of research

Regarding the methodology of the two empirical studies, it has to be stated here that both studies were approached in a cross-sectional research design. Developments and trends can therefore not be assessed. Moreover, both samples consisted of mid-sized companies in Germany and Austria with employee numbers mainly between 250 to around 2.000. This certainly limits the generalization of the results in terms of external validity to some extent. However, internal validity was accounted for since measurement instruments in both studies go in accordance with a lot of other empirical research. Still, for the second study amongst manufacturing companies, it has to be stated that the survey only investigated managers' perceptions. The employees' point of view was left out, although organizational values definitely are a topic relevant to all hierarchy levels. As with other empirical studies in the field, organizational values were measured here at one point in time while innovation performance was measured over a longer period of observation (namely 3 years). For the first study the correlation between trust and employee competence utilization is based on the perception of the employees. Also, in this study the measurement of trust and employee competence utilization is based on a snapshot evaluation, not taking time effects into account being involved in the development of trust. Data has been focused on a number of company cases from the business excellence environment being chosen based on a qualitative approach. However, results are relevant for medium sized manufacturing companies in Germany and Austria. They are of particular significance as they combine the managers' and employees' perspective to a comprehensive and holistic view.

As discussed, trust as an organizational value can come to its limits as well, particularly when it comes to innovation. For this reason, the authors suggest to investigate similar topics in other countries. With this, it would be possible to account for the influence of national culture. The authors assume that this does play a major role in value-backgrounds to innovation as well. Further to this, authors believe that more research is needed regarding the implementation of trust. According to the authors, there is a long way from knowing that something is important to actually putting it into practice. In the course of the first study recommendations for

strategic management are given in a balanced scorecards approach. Further practical recommendations for managers how to spread the ideas of this paper through whole organizations and use them to achieve competitive advantage and business excellence would be of high value.

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Appendices

Appendix I:

Model summaries for the Regression Analysis drawn from the company survey (study 2)

a. Dependent Variable: Inno performance against competitors: No of new products

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,236 ^a	,056	,044	1,140

a. Predictors: (Constant), Level of characteristic Trust

a. Dependent Variable: Inno performance against competitors: Pioneer disposition

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,125 ^a	,016	,003	1,066

a. Predictors: (Constant), Level of characteristic Trust

a. Dependent Variable: Inno performance against competitors: Speed of NPD

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,233 ^a	,054	,042	1,149

a. Predictors: (Constant), Level of characteristic Trust



Stress and Time Management Settings in University of Maroua, Cameroon

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The aim of this paper is to examine stress and time in educational management in Maroua University. These two phenomena are profound in educational issues in Cameroon due to the complex administration or management. Education comprised of diversity of activities ranging from administration, discipline, teaching, evaluation and learning. Each of these activities requires time schedule to avoid stress in the face of pressure. Administration requires planning, organizing, controlling, commanding, coordinating, reporting and budgeting. Each of these managing variables requires time, just as discipline, teaching, evaluation and learning should need. The situation may be affected by higher authority interference and cause a rush thus affecting every schedule in the system on this note, it is necessary that every administrator on management cadre should develop a list of activities such as admissions, examinations, sports, vacations and other ceremonies which requires his attention on daily, weekly, or monthly bases and there after allocate in a tentative fashion the most appropriate times for dealing with such activities. Some profile recommendations are: strict adhering to schedules to avoid overlapping or prolongation to other programs; the schedules should be pasted or placed at a convenient point in the office for reference to avoid forgetfulness: as an administrator, time should be allocated for meeting or consulting with visitors and subordinates; he should delegate functions to his accredited subordinates to crave chance or time for essential duty; he should review the school or organization programs on daily, weekly or monthly bases the degree to which his administration goals have been attained and he (i.e. administrator) should crave time for rest i.e. holidays, relaxation and various forms of physical exercises to revitalizes the body for subsequent activities. The paper recommends planning which is vital in management to avoid time waste which is scarce and organizing to avoid repetition and also derailed. Hence, a healthy climate may encourage staff participation in decision making, program, daily routines to avoid time constraint and stress, which by-products are hypertension, insomnia and poor or unsuccessful accomplishment of education programs in Maroua University in particularly and nation – wide in general.

Keywords: stress, time management, higher education institutions

JEL Classification: M10, M12

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Article History:

Received 29 November 2014 | Accepted 21 May 2015 | Available Online 01 June 2015

Cite Reference:

Besong Besong, J., 2015. Stress and Time Management Settings in University of Maroua, Cameroon. *Expert Journal of Business and Management*, 3(2), pp.105-110

1. Introduction

Stress and time are two issues that are of profound importance to educators and educationists. In our efforts to place our schools on a sound footing and thereby enhance the attainment of positive school outcomes for the benefit of our society, the two issues need to be adequately and properly managed. However, their coincidental placement or presence as suggested by the topic under discussion should not put us under the illusion that the two concepts, time and stress, have anything more than a spurious association. For this reason, therefore, we would take the issues or concepts individually and discuss each of it at that level.

The concept of stress is popular among most Cameroonians definitions that different people do not readily agree on. Selye (1956) considers it simply as the rate of tear and wear in the body and has proposed the Generalized Adaptation Syndrome (GAS) to describe its mechanism, McGarth (1970) considers stress as a perceived substantial imbalance between demand and response capability under conditions where failure to meet demands has important perceived consequences. But generally, most people consider stress from the point of view of destabilization of the equilibrium of the body mechanism by external factors (Stressors) and the restoration of this equilibrium (homeostasis) is effected by stress responses. In essence, when our system (body) is assaulted by events or incidents that put it in a state of disequilibrium, it musters its available resources to achieve self-protection. It achieves this through stimulating the body organs in readiness to dissipate huge energy reserves in order to counter the assault.

Teaching and educational administration are both characterized are high stress occupations (Milstein and Golaszewski, 1995). Teachers are generally stressed by the effects of violence, the disciplinary problems encountered in the course of dealing with students, the diminishing purchasing value of the Francs, the possibility that there may be no salary at the end of the month, the increasing social expectation that teachers metamorphose into magicians in order to cure society's ills (Spark, 1979). For administrators, they must cope with the growing and diverse demands from teachers, their own superiors, and the communities they serve. Both groups are often overwhelmed by the mounting paperwork and other time consuming tasks that stare them in the face. The end result of all these are that many talented men and women in the education enterprise who have high achievement expectation become dispirited and disillusioned. Some leave the profession. Those who stay must contend with a multitude of physical, emotional and behavioral stress – related manifestation (Walsh, 1979; Needle et al, 1982). In the Cameroonian situation, Denga (1991) has noted that the need for economic survival, the fight for political supremacy and all that go with it, the intense competition in the classrooms, the routine bustle and hustle of life have all together sentenced the citizenry with hard labor to stress and depression.

Stress may be manifested in various forms including physical exhaustion, hypertension, ulcer, lower back pain, insomnia, overeating, drug or alcohol abuse, mental fatigue, extreme sensitivity, diminishing sexual appetite, occupational burnout, absenteeism, fear of crime, disease, religious disturbances, rage, retirement, etc. the list is almost unending and, perhaps, should suggest the need to scrutinize our personal conditions or problems with a view to ascertaining whether or not they are stress-related.

Over the decades, researchers have worked tirelessly to isolate categories of organizational based stressors (Chernis, 1980; Cooper and Marshall, 1978; French and Caplan, 1972). From theirs and other studies, Milstein and Golaszewski (1985) have extrapolated the following five categories or sources or organizationally based stressors:

i. Relationships at Work:

The critical issue here is the degree of extent of interaction on the job among workers either on a horizontal or vertical dimension. The horizontal deals with interaction among individuals at the same level while the vertical relates to the interaction among those at different levels e.g. the student and teacher, principal and the school Supervisor, the Supervisor and the Director General in charge of the post Primary Schools Management Board. There is a direct relationship between the extent of trust demonstrated in the relationships among organizational members and their feelings in job satisfaction and well-being.

ii. Organizational Structure and Climate

This relates the degree to which individuals in an organization participate in decision making. Such participation engenders a feeling of belonging. In a school situation, it may include such diverse areas as whether school Supervisors provide effective Supervision and support to schools and teachers, whether communication across the various levels in the organization is clear and sufficient, and the degree to which limitations are placed on the behaviors of members of the system.

iii. Factors Intrinsic to the Job

Different occupations and jobs have their peculiar built in working conditions such as extent, type and place of work, the physical energy demanded of the job, the total number of hours and the specific hours of

the day or night spent on the job, the factors such as space, lighting, noise level and availability of private space.

iv. Role in the Organization

Stress may be induced by some job related factors such role ambiguity (confusion relating to scope and responsibilities associated with the job), role conflict (being pulled in different directions by incompatible demands), roles that are high in responsibility for people, and the perception that there is minimal authority or power associated with one's organizational role.

v. Career Development

These deals with whether or not there is some built – in career progression such as improved status, opportunity for advancement and salary increase, etc., for members. It also relates to job security, perception of low probability of reward for efforts committed organizational progress. The above stressors operate essentially in job-related organization and individuals who are incapable of coping satisfactorily with them soon begin to show manifestations of stress. Denga (1991) has also listed such other stressors of personal type (some individuals have greater drive for achievement), lifestyle, physique, lack of leisure environmental proneness to risk, etc. in all cases, there are two major pattern of stress, First there is the prolonged, degenerative and chronic pattern. This extreme pattern or type may lead to hypertension and various forms of heart diseases. The second type is the situational or transient form. These generally linked with specific environmental events or situation. Typical examples include test stress, marital stress, stress due to some forms of danger, etc. as soon as the object or event that induces the stress is removed, homeostasis is restored. Our concern for transient or situational stress arises from the fact that its occurrence may inhibit an individual effort to function maximally in an educational setting.

1.1. Dealing With Organizational Stress

In organizational situations, the tendency learns more towards creating an environment that is free of stress rather than allowing for the onset of stress and thereafter seeking strategies for its management. Stress strategies for creating a stress-free environment are:

- i. Encourage responsible interpersonal among members of an organization. An organization is made up of individuals. These individuals should be able to interact freely within the limits of organizational rules in order to generate feelings of security, trust and job satisfaction.
- ii. Create an atmosphere in educational and administrative settings in which members of the setting have ample opportunity to contribute to or participate in decisions making and the related processes. Apart from eliminating the related stress, such participation will generate a sense of belonging and self-esteem. Communication of organizational decisions must be made to all members in very clear terms with appropriate explanations where necessary.
- iii. The daily input by workers, in terms of number of hours into an organization should not exceed that needed to maintain them in optional functioning condition on a daily basis. There is very little to gain from a situation where overworked staff continually report of incapacitation due to ill-health. The issue of space and noise in school situations must be adequately addressed in order to promote better mental health and productivity.
- iv. Individuals functioning in official capacities in Schools and related professions must have their roles adequately defined in unambiguous manner for the purpose of clarity. As much as possible, situations where too much power or responsibilities are entrusted in the hands of a few officers must be avoided. Power and authority should be delegated to all those who can use them responsibly.
- v. There should be some School or organizational based mechanism that rewards hardworking individuals with career progression and opportunities for advancement in terms of status, salary and job security. Workers must perceive the probability that their efforts would be rewarded in some positive manner.
- vi. Administrators must on a regular basis conduct surveys using appropriate strategies such as questionnaires, interviews and observational schedules for the purpose of determining current levels of stress among workers and students. Only such a survey would provide the needed data for organizational intervention and also identify stressors operating in the academic, occupational, social and environmental Spheres.
- vii. Where the existing level of stress in an organization exceeds a threshold limit, appropriate stress reduction techniques such as relaxation technique, anxiety management, cognitive appraisal, emotive therapy, behavior modification internationalized dialogue, shared group experience, etc. may be applied by individuals with the experience. However, those with extreme levels of stress must see a doctor.
- viii. Educators and educational administrators must persistently encourage the habit of a good use of leisure time for relaxation, games, rest, physical activities and different forms of mental diversion.

1.2. Time Management

Time is a very important variable in the life of man. Evidence of the significance of time in our life is very apparent in such common statements as “Time is money”, “Time waits for nobody”, and “There is time for everything”, “A tick of a clock is never regained”. In an educational setting, the significance of time in the life of learners assumes a certain level of dimension. There is so much to be learned within so short a period of formal exposure to school learning that curriculum developers must apply some degree of selectivity to determining the educational experience to which learners are subjected. The element of selectivity in curriculum development underlines the critical importance of time in school related activities. Even at the administrative level of education, time is no less of critical importance. Yet our schools spend a depressing amount of their time trying to teach children to sit quietly and to act calmly when research resulting points to the fact that intellectual excitement is usually accompanied by physical, verbal and emotional excitement. Similarly, large muscular movements have been shown to facilitate certain kinds of learning. This in essence implies that we, as educators, waste time teaching children to vegetate at nearly aligned desks, and by our success, we hinder the process of education.

2. Literature Review

In educational literature review Carroll’s (1963) model of learning has served as a focus for time-related studies. In this model, Carroll proposed that learning is a function of time needed and time spent. However, most studies of school time have concentrated on measurement of learning using such indicators as number of days in the year, weekly, monthly and daily school attendance; number of hours of exposure to instruction as well as proximate measures of time – use such as student attention or engagement. Such related studies do suggest that time spent is positively and moderately related to students’ academic achievement. However, if we are to effectively understand the potentials of school time as an agent for ensuring greater or enhanced learning, there is very little to gain from global studies of the effect of time. An average effect size has less information to communicate than to hide since certain dimensions of time are not directly manipulative. Indeed, in order to effectively gauge the effect of time as an educationally relevant variable, there should be studies that accurately measure the link between student engagement and achieved level of learning. Similarly, to ascertain the potential of engaged time, there is also need for studies that document how engaged time is related to allocated time such as length of school term or day.

In the recent decades, legislative houses aiming at increasing academic achievement in schools have relied almost exclusively on increasing the number of days in a school year, number of hours in a school day, and number of minutes allocated to a given subject or topic. However, the actual use of scheduled time may vary depending on such school factors as students’ school attendance, the erosion of instructional time by non-academic activities and events, and students’ perception of a given instruction in a given subject as necessary for his future. On a general note, differential use of allocated time in classrooms and schools implies that studies of the effect of allocated time are of limited value for understanding the actual effect of increasing the school term or day. Thus, allocated time measures are too far removed from the variable of interest time engaged with instruction to unambiguously tell us about their impact on learning.

Cross-national comparisons of academic achievement and time indicate that in the U.S., the 180 days school year is significantly shorter than the 240 – day year in Japan and Taiwan. In the U.S.A., achievement at the elementary levels is behind that of a similar category of learners in Japan and Taiwan (Stevenson, 1983). Given the above fact, it has been implied that U.S. could achieve comparable academic levels as Japan and Taiwan by increasing U.S. time allotments. Such interpretations obviously ignore the necessary cautions for attributing causality in correlational studies. For it is very necessary under conditions to convincingly argue that time effects are indeed due to time differences and not to some other effects that masquerade as time. According to Karweit (1985), while difference in time allocations may vary with achievement differences, manipulating the time allocations may not drastically alter achievement because time per se may not be the cause of achievement differences. There is, however, the possibility that societal and cultural difference in education, not time differences, is largely responsible for achievement differences. In essence, allocating more time may or may not be a reasonable strategy for increasing achievement.

Given the above and other relevant data, it is apparent that we know very little about reasonable goals for how much of school day can be used for instruction and how much day allocations we may make towards increasing the school year. Similarly, we have little systematic data to guide teachers and students under different settings and for different types of tasks. What is needed is to examine the relationship between time and learning in studies that have measured time as engagement with learning. This is to say that as our present

knowledge is concerned; time management by way of increasing or decreasing length of school year does not have the relevant data to guide such nations.

A basic fact about good and effective time management is that it is a learned skill that an individual teacher or student may habituate once acquired. Habituation implies that ability to manage time effectively may ultimately become a routine part of the individual's day to day activities. It has such advantages as freeing the individual from unnecessary and unproductive dissipation of energy, ensures a much better use of available time and puts more time available in our hands for other productive ventures such as leisure and relaxation. Common sense knowledge indicates that students, teachers and administrators become more efficient on their respective jobs when they plan and manage their time adequately and effectively. Inability to plan an effective use of one's time often leads to indecision and mental conflict. Students and administrators who lack time management skills often complain of having too much to do at a given point in time. Generally, successful students are those who plan and use their time properly.

What time management calls for is an individual's effort to program his daily routines. It achieves its results by way of getting the individual started with specific tasks, drawing the individuals' attention to the variety of tasks to be accomplished, reminding him or her about leisure time and eliminating the practice of procrastination and thereby avoiding the possibility of a rush at the last minute.

2.1. Recommendations:

Suggestion of procedures for effective time management: The following are some suggestions for effective time management:

i. Every administrator, school principal, or classroom teacher must develop a list of activities that require his attention on a daily, weekly or monthly basis and thereafter allocate in a tentative fashion the most appropriate times for dealing with such activities. Experience or practice in adapting oneself to such a schedule may demand the need for modification, a radical change or for continuity in terms of allocated time in hours or minutes and in terms of the specific times of the day allocated for a specific activity.

ii. It may be essential to have such a schedule placed or pasted at a convenient point in the office where it may be referred to at will for the sake of guidance. Given the limitations of the human memory, a display of one's work schedule may become easily understandable. For administrators who enjoy the services of secretaries, the schedule may be kept and maintained by such a personnel while also maintaining the responsibility of acquainting or reminding the boss of the next schedule of activity. Once a schedule has been regularized and the administrator is therefore comfortable operating it, efforts must be made to, as such as possible, keep to it. However, the need for flexibility may be respected as demanded by specific occasions or events.

iii. Administrators are public servants. They require some time for meeting or consulting with visitors and subordinates. While such consultations are part of the administrator's daily routines, care must be taken to ensure that they do not consume the entire working hours of the administrators. Many administrators have developed the strategy of depicting conspicuous notices on their doors that specifically indicate times for meeting different categories of visitors. A good practice is to refer visitors with certain categories of need to subordinate officers to handle. An effective school principal will have no business settling a fight between two students. He would rather refer all such cases to the discipline master or, perhaps, the school guidance counselor.

iv. Administrators with subordinates must realize that a good component of their skills as effective time managers include ensuring that those under them do adequately and appropriately apply themselves to the responsibilities associated with their offices. To achieve this would require on the part of administrators some degree of supervision, effective communication, good relationship, motivation and organizational discipline. While some of the above factors do not appear to bear any relationship with time management, it would be apparent that their absence in an organizational situation may cause low productivity under which poor time management may be subsumed.

v. An important aspect of good time management requires an effort on the part of administrators to regularly review on daily, weekly or monthly bases the degree to which administrative goals have been attained and the obstacle encountered in a bid to implement one's official or personal schedules. Such a review need not be a personal responsibility of the administrator but should involve the subordinates and, where possible, some superior officers who may adequately contribute to identifying inherent problems related to the attainment of organizational goals.

vi. Avoid the practice of confusing or combining official with personal responsibilities. Taking out hours to receive and entertain personal guests either in the office or in one's personal residence is unproductive since these contribute nothing to the achievement of organizational goals. As also does the often observed

practice among administrators to move into their colleagues offices for the purpose of engaging in idle talks and gossips while members of the public needing their services must wait almost endlessly.

vii. Good and effective time management must be oblivious of the limitations of the human body and mind. While it is expected that public officers painstakingly commit a great deal of their time towards attaining organizational or social goals, wise administrators nonetheless do carve out some time for rest, relaxation and various forms of physical exercises. Excessive work that is not adequately cushioned with rest and relaxation would for sure lead to mental fatigue and physical breakdown – and the various forms of discomfort and loss in man – hours that are associated with them. The loser in such a situation is the individual and the society.

3. Conclusion

Effective time management and absence of stress are two social objectives that are of immense interest to organizational managers. The two objectives aim at ensuring members of an organization in University of Maroua in particular and in Cameroon in general should apply themselves the need to achieving specified social objectives while maintaining individual or personal mental health. These objectives have scarcely been met in Cameroon society given the productively level our economy and the large number of mental cases that stare us in the face on a daily basis. What these circumstances suggest is that most Cameroonians live a life that is full of stress. The entire problems have been the lot of the average Cameroonians for the last three decades. There is very little light at the end of the tunnel. This would suggest that part of the survival of the Cameroonian citizenry may be achieved through teaching citizens the requisite skills for coping with stress. On the part of organizational managers or administrators, they must learn to make every minute count towards their efforts at achieving social or organizational goals in University of Maroua.

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Producing Just Papers or Creating Added Value? Snap-Shot about Quality Systems at Hungarian SMEs

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In this paper, a short historical review and the research results are presented, which are focused on the quality management systems used by the Hungarian SME's. The research was based on an original empirical survey, conducted using a random sample of fifty managers from small and medium sized Hungarian enterprises. All of them use certified quality management systems. The paper presents their current state in the light of their responses, under several aspects. In conclusion, suggestions are given for the problems, such as measurement, development, and education on the research topic.

Keywords: *efficiency, management, process, quality, sustainability, quality management system, improvement*

JEL Classification: *M10, M12*

1. Introduction

Currently there are approximately 11.000 companies in Hungary, certified according to ISO 9001. Fifteen years ago, in 2000, this number was only 3280, and thus the increase of the number of certified companies is really impressive (Bálint, 2004). Under this premise, the current research is conducted to provide a better understanding of the companies' ISO certification process and organizational behavior.

2. ISO Certifications in Hungary

2.1. Possible Reasons of Increase in ISO Certifications

This increase of companies adoption of ISO certification can be explored through the following questions:

- Is the new version of ISO system (ISO 9001:2000) more user-friendly?
- Is the market requesting the certification? Could it be, as in almost all cases, that the supplier evaluation checklists starts with this particular question?

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Article History:

Received 1 July 2014 | Accepted 28 July 2015 | Available Online 03 August 2015

Cite Reference:

Nyerki, E., Lippert, R., Nyerki, E. Jr, 2015. Producing Just Papers or Creating Added Value? Snap-Shot about Quality Systems at Hungarian SMEs. *Expert Journal of Business and Management*, 3(2), pp.111-118

- Is quality system just a fashion phenomenon? Followed by further systems, like environment, IT security, EHS system?
- Does certified quality systems create added value through controlled operations? And is it in a business's interest to introduce and certify?

Most probably there is no exact answer as all reasons are partly valid. The real answer can be completed from all these aspects. Considering the significant differences between the "old" (Edition 1993) and "new" revision of the ISO 9001 standard, four important factors can be identified:

- The "old" ISO system is quite complicated and for a proper interpretation, deep knowledge is necessary. The ISO 9001: 2001 contains major changes:
- The "new" system is not only applicable for production companies, but usable for service providers and institutions too.
- The modified system is fully customer oriented. Until recently, the continuous level of production was targeted, now the customer is positioned in the middle of the activities (Róth, 2000).
- Requirement of quality system is harmonized with other management systems, enabling the creation of integrated management systems (environment, EHS, IT security).

2.2. Market Requirements

In the last years, the existence of certified quality systems is more and more a requirement for possible suppliers. Is this a reflection of customers' requirement, or is the profession pushing work towards suppliers? It is much to ask for a certification, than making a detailed and professional process audit, although the causality between professional operation and certified quality system is not always given. There is a number of small family-owned companies, where certification means not only a high cost, but does not influence the daily operations. Technology and staff are given, processes are running, the „management review" was achieved after „Sunday's lunch" – but it was not called „management review". Does certified quality systems help making the business results better? Most probably not, but it does help companies to get more business.

2.3. Costs of Certification

According to a study made in 2008, certification cost of a company under 51 employees is between 500.000 - 1 Mil.) HUF (1850-3700 EUR) for 3 years. On average, 11.000 certified companies are generating business of 2.750 Bil. HUF for certification bodies.

2.4. Certification Phase

Market is growing, once it is full, companies will not be interested to get certification anymore. From a business point of view, it is a must to create a new system, set up certification standards and convince big market leaders of a need. Also, it is necessary to certify the whole supply chain from the smallest company up to the biggest one. We are not implying that certified systems are without value, of course, but majority of those systems' requirements are needed to be fulfilled, as it is a logical must. Let us consider the requirements of the environmental, work safety, and IT rules. Nowadays, energy management systems are under installation.

2.5. Quality Management as a Tool of Business Excellence

Spending 10 years in quality management, the answer is most definitely yes, that the quality management as a tool of business excellence. If during the establishment of the system's business efficiency was set as a major goal, keeping procedures resulted „automatically" in business success. If it is a bureaucracy or a copied system, the requirements of „real life" and the quality systems are never meet.

Glaser-Segura, Peinado and Reis Greml (2009) presented the results of a survey conducted via managers from 248 companies from Argentina, Brazil and Romania. They measured practices related to quality, waste reduction and supplier management, as well as their managerial and HR support practices. The result of their study shows that the achievements in emerging and transition economies are not as good as they are in developed countries.

Ebert, Tanner and Tutures (1998) carried out an extensive survey involving Romania's manufacturers, which are adopting lean manufacturing and quality systems in order to improve their competitiveness, faced with the fierce conditions of the global market. They argued for the need to change the syllabus of operation management and other engineering subjects taught in the country's schools.

According to Glaser-Segura and Anghel (2003), the quality problems of Romanian manufacturers were caused by the influence of old values, from the time prior to the revolution, when the communist

government dictated the levels of quality, prices, production volumes, logistics programming and other decisions related to the production strategy. Marinescu and Toma (2008) produced a case study which pointed out that lean production could be successfully applied to Eastern European countries, such as Romania. The main achievements of lean implementations are: waste reduction, increased productivity and better teamwork.

3. Methodology of Research

The questionnaire-based quantitative survey was carried out involving employees and managers, represented mainly from the capital city and western side of Hungary in 2010. Until the closing of the survey, we received 55 answers, out of which 50 responses were gathered from the targeted and researched company size, namely small and medium size enterprises. Additionally, personal structural interviews have been conducted with 5 partners. These interviews assisted as a qualitative method in the formation of the questionnaire, as well as in the evaluation of the findings.

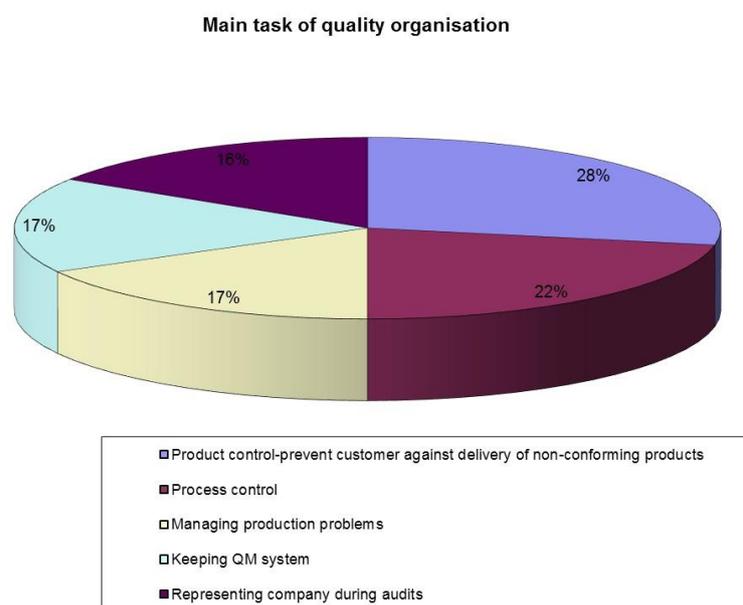
Questions were focused on the following areas:

- Qualified quality system supports the organization to reach business goals.
- Instructions are known and followed by employees.
- Complexity of quality system.
- Continuous improvement.
- Follow up of key performance indicators.
- Preparation of audits.
- Typical tasks of quality organization.

The full research question instrument are listed in Appendix 1.

4. Analysis and Results

4.1. Tasks of Organization's Quality



The number 1 position of the „control function” of quality organization is not a surprise. It was valid 30-40 years ago, when the „perfect quality was equal to more strict control” (Szabó, 2012). Sometimes the opinion „production should produce; quality should control” is coming up in daily operations and the research's result.

Seeing the business success of the company, this opinion is quite dangerous. The „conform product” and the “sellable product” is not the same. There are conflicts between interest of the company, producing more for less cost, and interest of quality staff, being more important in hierarchy of the company - no failure, no need for quality staff.

4.2. The Use of Certified Systems in Helping to Reach Business Goals

Based on a survey result, the answer to question “Does certified system help to reach business goals?” is close to „yes”, as figure 2 shows.

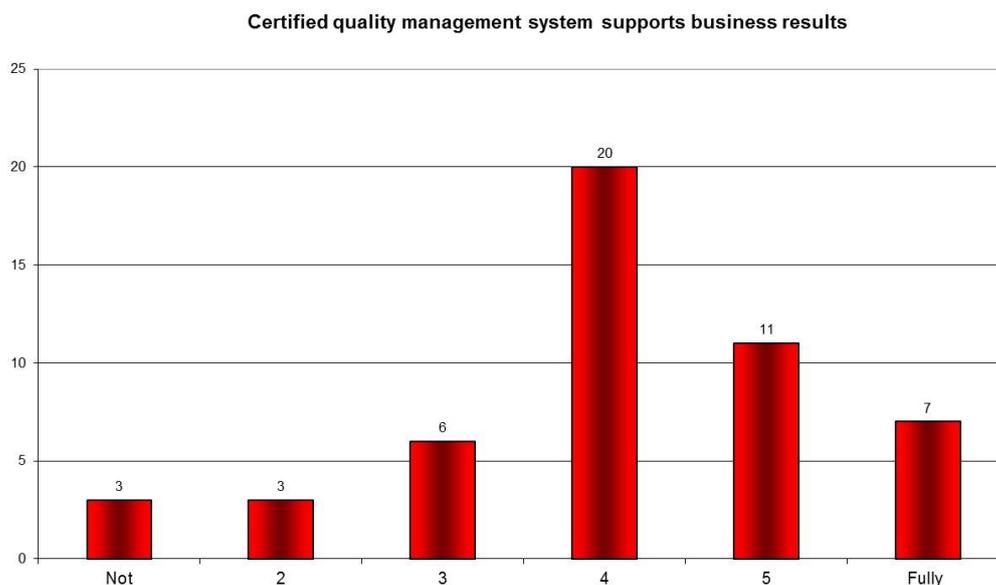


Figure 2. Effect of certified quality system to the business result

The average of the answers is 4.04 and the distribution is asymmetric as the majority of responses are on the positive (4-6) side. This reflects the opinion of leaders and it shows the good news that the decision makers are convinced about the business advantages of a quality system. It can be supposed that necessary resources will be provided for the quality team to build up and maintain a quality system.

In this framework, we aimed to answer the question “Is not it valid for the lower level of organization, too?” to exhibit the inclusion of employees in the quality service. The results are presented in figure 3.

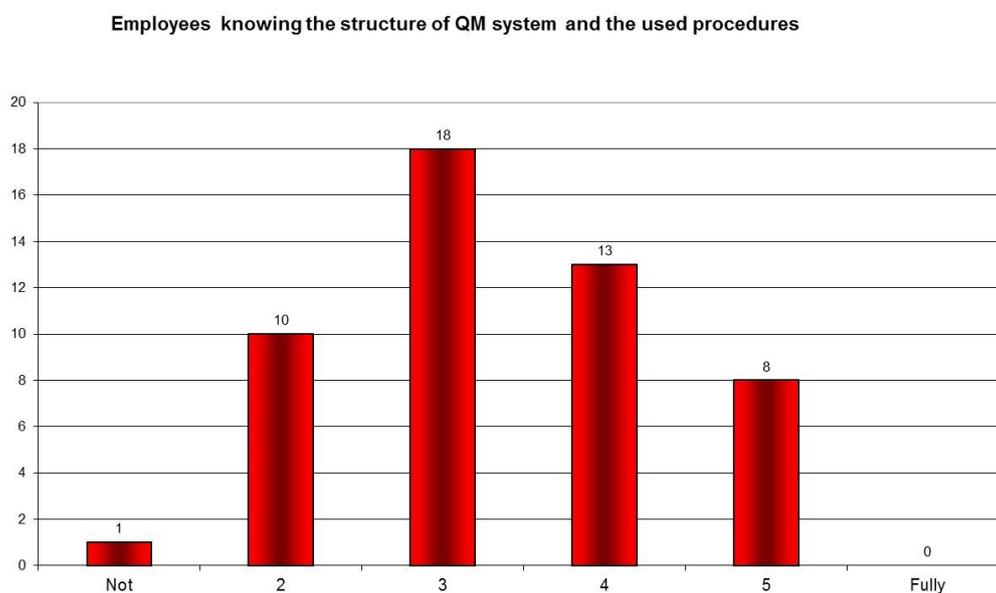


Figure 3. Are procedures known by the employees?

For figure 3, we studied the research question “Are descriptions and procedures known by employees?”. Average for this question is 3.55, but the distribution is more interesting. In a previous question, 25% of the answers were on the „negative side”, now 23 answers are stating negative opinion, which means 47% of total answers. In other terms of explanations, although the management support is there, the employees’ support is at least „limited”.

The next surveyed topic regards the following of rules: the reached 3.55 shows the same value, as in a previous question, but the distribution of answers is more asymmetric, 57% of the answers falling into the negative pole of the response. This is an indication that there is a gap between real life and quality system requirements. Some people do not even know what procedures to follow, but there is a portion that knows, but fails to do so.

All employees following the quality procedures during daily work

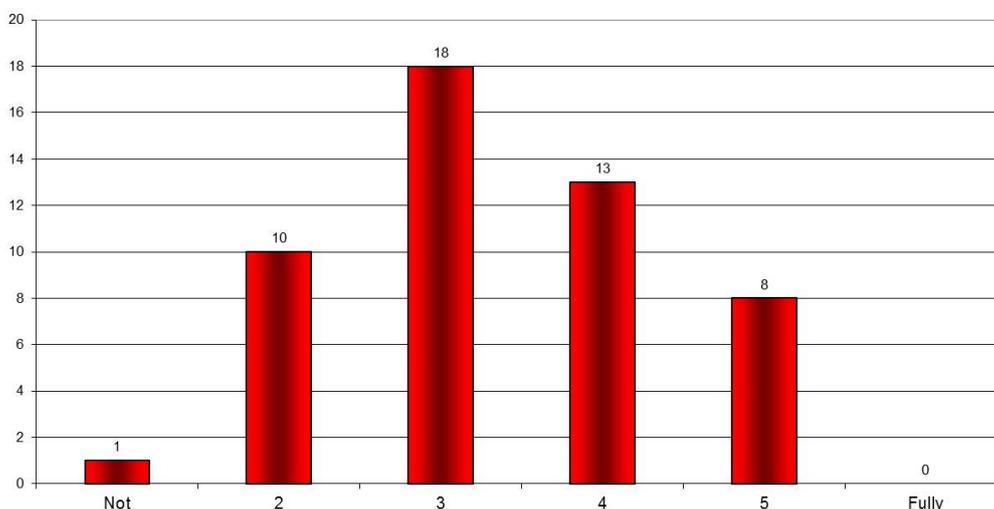


Figure 4. Following of quality procedures

One possible reason for non-following rules is the complexity of the rules and procedures. This particular topic highlighted the following results:

Following rules due to the complexity of quality system is impossible

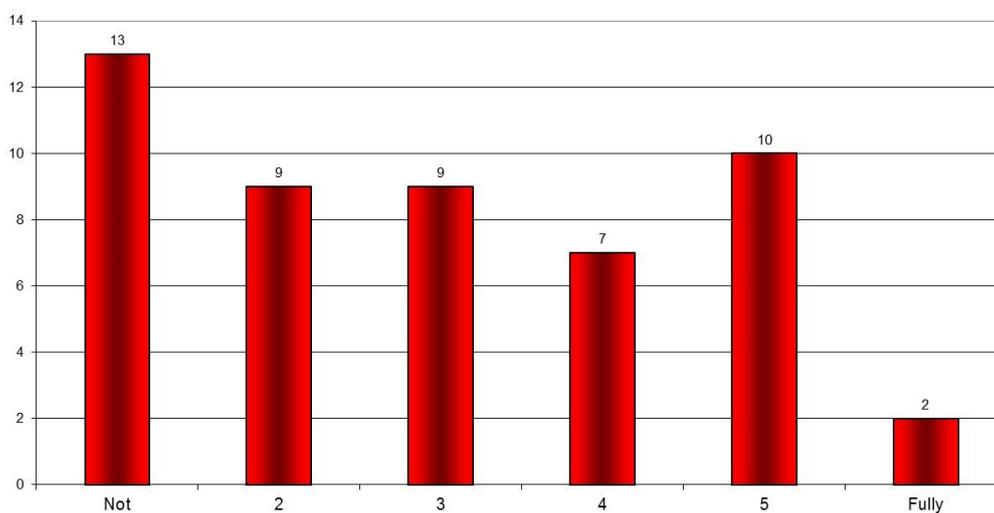


Figure 5. Is QM system complex?

According to 61% of the respondents, the answer is „no”, which means the system is not complicated. Worryingly, the remaining 39% of the responses showed that due to the complexity of the system, there is no possibility to use it. In this case, quality management system is a fascinating aspect, known by some special skilled people.

Under these conditions, we asked “How can the continuous improvement work under these circumstances?”, and the answers are visually presented in figure 6.

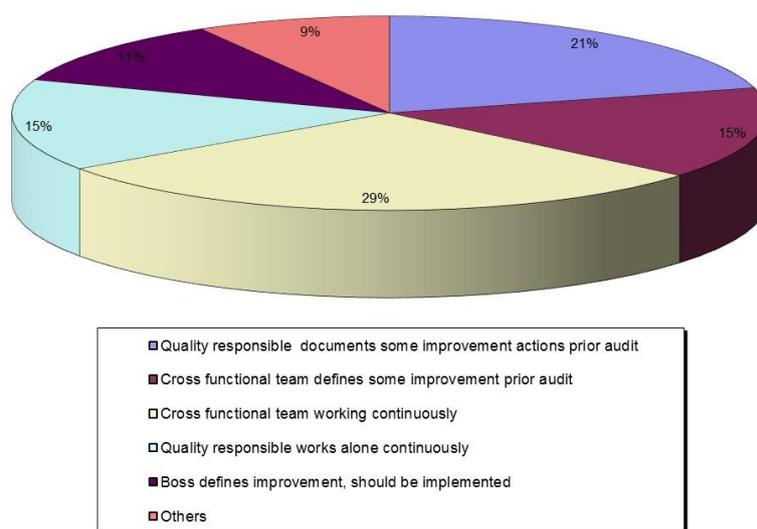


Figure 6. Continuous improvement

Improvement is really continuous according to 29% of the researched companies' respondents. 15% are doing an improvement, prior to audit, and further 15% of responses show that there is a „lonely hero” effect in creating things if they can be sold throughout the organization, and this means that he can win. If not, the process will work only on paper. „Continuous improvement” as mandatory task for audits is 36%, and in 11% of cases the boss is bringing ideas in and they should be realized.

4.2. The Need for a Quality System

It was almost agreed, that certified quality systems support companies to improve the business results, but based on the opinion about the main purpose of the system, 2 groups can be identified: for group 1, the system really helps; for group 2, it is crucial to „survive” audits so that companies can publish certifications for customers.

Therefore, the last research question asked the opinion about the main purpose of quality systems. In figure 7 we can observe the outcomes. Thus, 28.6% of the researched companies stated that quality system is a supporting tool, 32.7% said it could be a good tool if it worked properly. For 26%, a quality system is a mandatory task requested by customers, and for 6%, it is not necessary.

In the best case scenario, with ratio 40:60, the quality system is a tool and not a goal.

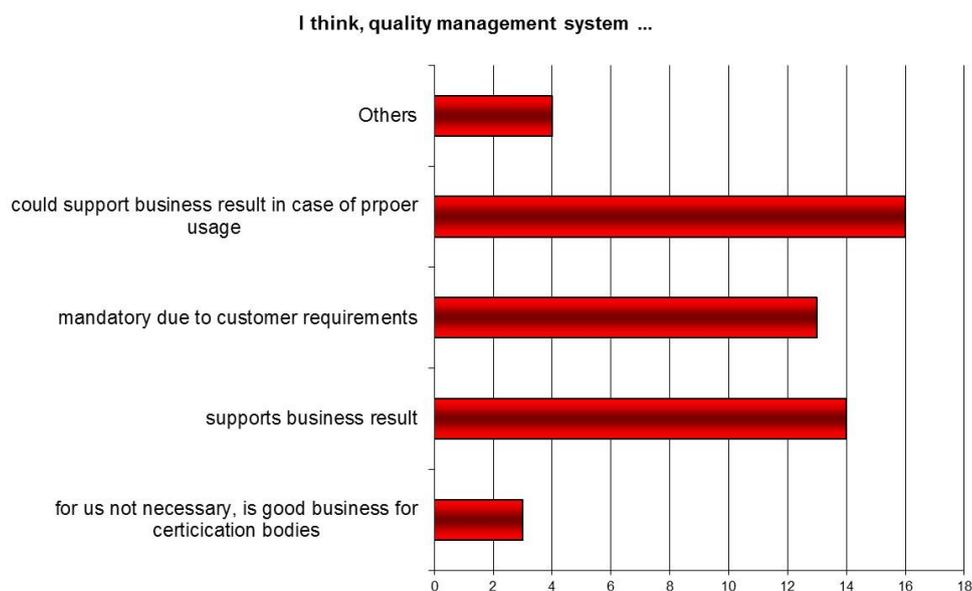


Figure 7. General statement about quality system

5. Discussion, Conclusions, and Proposals

The research has confirmed that there is a measurable gap between written procedures and the daily operations of companies. Seeing the development of quality management systems in Hungary, the behavior is almost natural. Until 1971, quality work was equal with quality control (Szabó, 2012). Quality systems were initiated by the government from 1980, with the support of Professor Shiba from Japan. When governmental support and financing stopped, companies interrupted the development of the quality systems (Kovács & Uden, 2012). After the regime change in 1990, joint ventures and multinational companies were grounded, and from that time, it was a natural task to build up and certify quality systems (Szabó 2012).

In order to keep the system as part of the usual daily operations, authors are proposing to establish:

a. Measurement. For this aspects, companies should operate under the idea of “Get measured – get improved”. Establishing KPI metrics and following them up frequently. It is recommended, that not only “quality related items” should be measured, but also the expression of all parameters in relation to business influence. Sometimes asking quality staff, what is the „re-payment” rate of their salaries?

b. Development. With support of upper management, this development suggestion could be implemented by starting a process review, and if necessary, adjusting the process. Involving the management is the key: if they are treating the action as „investment into the future” it will be easier to convince the staff about the project.

c. Training. The basic rule: quality management is not equal to quality control, and should be deployed during all possible sessions. It must be clear for all employees, that structured operations and „data-based” decisions are necessary not because of the audit, but because they are in the best interest of the company.

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Appendix 1

Research Questions of the Measurement Instrument

What are the main tasks of a quality organization?
Do you think, that certified quality system support reaching business goals?
Are quality procedures known by all employees of the company?
Are quality procedures followed by all employees of the company?
Do you think that the installed quality system at your company is complex?
How are you performing continuous improvement actions?
What is your general opinion about quality system at your company?



Quality Service and its Relation with Global Satisfaction in Fast Food Consumers. A Case Study

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The present study analyzes the quality service perception and its relation with the satisfaction for the fast food consumers of hamburgers' sector of the chain Burger King in Hermosillo, Sonora. By the application of Servperf of Cronin and Taylor methodology and a data regression method, through the coefficient of determination (R^2) was determined that the independent variables explain the variability or variance of 82.9% in consumer satisfaction and that the explanatory variable which has the most influence in absolute value over the explained variable is reliability, due to its standardized beta is 0.301, being the highest score among the variables. To achieve the objective of this study, a quantitative and correlation investigation was designed, where data was collected from a survey structured by five dimensions, measured by 22 items. It was applied to a random and representative sample of 385 consumers, with a 95% level confidence and a $\pm 5\%$ of permissible error. An inferential statistical analysis allowed observing a positive relation between consumers' satisfaction level and quality service. The results showed that Servperf is a valid instrument with psychometric characteristics of high reliability that makes it appropriate to measure quality service. The same way, it was observed an index of service global satisfaction of 69.27%, which according to the scale used implies clients are satisfied with the received service.

Keywords: quality service, consumers, satisfaction, Burger King, Servperf

JEL Classification: C10, M10, M30, M31

1. Introduction

Nowadays, the quality term is applied and defined, as well as in the industrial sector as in the service sector, with all the properties, characteristics or qualities of a product or service to satisfy the implied preferences of consumers or users (Kotler, Bowen, Makens, 2005). According to Cantú (2006), quality has

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Article History:

Received 24 June 2014 | Accepted 5 August 2015 | Available Online 10 August 2015

Cite Reference:

Ibarra Morales, L.E., Velázquez, J., Partida, L., Franco, C., 2015. Quality Service and its Relation with Global Satisfaction in Fast Food Consumers. A Case Study. *Expert Journal of Business and Management*, 3(2), pp.119-128

had a long evolution that gives a great complexity to the concept itself, due to the existence of a variety of criteria and points of view that can be applied to the service sector.

On the other hand, the service offered by the food sector, especially the franchises dedicated to the commercialization of hamburgers, must build a fundamental pillar in its corporative and functional business model strategy. This implies having guaranteed, not only the sales income but going further by assuring that the products and service offered, represent the satisfaction of consumers' needs, preferences and demands; or in other words, the quality perception.

Clients' satisfaction nature is based, according to Lucas Arocas (2000), on the evaluation that the clients make of the service's attributes when it is offered or provided, which corresponds to a purely cognitive process. Setó (2004) considers it is important to include the customers' needs as an affective-cognitive process to the models or groups of attributes indicated in the literature.

In this investigation, an analysis of quality service is performed upon the basis of a measure scale and having as a case study the Burger King franchise, company of the fast food sector, specifically hamburgers, in the city of Hermosillo, Sonora, México.

The approach used to measure the quality service and the global satisfaction of this branch's clients, was the one designed and proposed by Cronin and Taylor (1992), Service Performance (Servperf). The model is based on the performance, and this is the reason why it only considers the consumer's perception as the producer of the satisfaction dimension. The Servperf instrument uses the same attributes of the Servqual Method, designed and proposed by Parasuraman, Zeithaml and Berry (1988).

Servperf is based on the following five dimensions: tangible –the physical environment represented by visual elements, communication and facilities' comfort; reliability –the service is provided with responsibility and precision; responsiveness –the company's willingness to offer an efficient and fast service; assurance –diverse elements that provide reliability and assurance to customers; and finally, empathy – company's ability to offer each client a personalized service.

2. Literature Review

Different studies have tried to define, measure and explain the concept of quality service and customer satisfaction (Cronin and Taylor, 1994; Parasuraman et al., 1985; 1988; 1991; Teas, 1994); however, these two terms have been considered as synonyms; are used interchangeably, which has provoked a major complexity at the time of studying quality in the service.

On one hand, the quality in the service promotes clients' satisfaction, the desire of coming back and developing certain loyalty to a certain service or brand; while on the other hand, the concept of satisfaction and quality service are closely related, to the point that these two constructs tend to be confused and overlapped.

2.1. Quality Service

There is not a unique definition for quality service, neither a unique manner to be measured. Quoting some authors and approaches, for Jain and Gupta (2004) service quality can be seen as continuity between "ideal quality" and "totally unacceptable quality". For Stevens et al. (1995) it is the customer's perception about the superiority in the service received, containing two great dimensions, the intangibles –perceived as the attention offered by the personnel, and the tangibles –as the physical facilities or personnel appearance. On the other hand, for Chao (2008) quality service can be conceptualized in the form of four attributes: personnel, operation, physical appearance, and merchandise.

In general terms, the two most common manners of measuring the perception of service quality is by asking the consumers to express their opinion about the quality received when a product or service is given at a certain moment (Oh, 1999). The other one tends to be the predominant in literature, and is the Servperf items designed (Cronin and Taylor, 1992), or any others derived from this instrument or the ones proposed by Parasuraman et al., (1988), in which the five dimensions of service quality are identified: tangible aspects (physical environment), reliability (accomplishment and consistency), responsiveness to customer's needs, offering assurance and empathy with customers.

The validity and reliability of the Servperf instruments have been tested in different service contexts, being an instrument widely used by researchers and academics. It is important to mention that the 22 items can be adapted or adjusted to the type of industry or service sector that will be analyzed, in order to avoid confusion or discrepancy at the moment of being applied to customers.

2.2. Elements that Constitute Customer Satisfaction

Customer satisfaction is basically composed by three elements: (a) perceived performance, defined as the result of the customers' perception in the performance achieved by the received service or product; (b) expectation, defined as the customers' assumption of receiving something, which can be the result of promises made by the company, of previous experience-related buys, people's opinions and promises made by the company; (c) satisfaction levels that are produced when the purchase or acquisition of a product or service is done, then the customer perceives one of these three levels of satisfaction: not satisfied –when customers' expectations are not fulfilled; satisfied –when the product or service received meets clients' expectations; and complacency –it is produced when perceived performance overpass customers' expectations; in that manner, a pleased customer will become a loyal client to a brand or a service due to an emotional affinity that overcomes a rational affinity.

2.3. Fast-Food Sector

The commercial activity has a great importance in México, independently of the different categories on the market, especially in the fast food sector, since the remarkable growth in the sector sales has been accelerated, as well as the amount of companies where this sort of products are promoted and commercialized.

The fast food market is constituted by companies, transnational ones as well as small ones, dedicated to the manufacturing of food consumption products; in that manner, since the 90s a turning point in public politics is marked, with the signing and implementation of the North American Free Trade Agreement (TLCAN by its acronym in Spanish) a process that began and allowed that transnational companies, including a diversity of franchises, to be inserted in the service sector dynamic. Burger King, as the rest of the franchises installed in México and the State of Sonora, is a chain of restaurants specialized in hamburgers. These types of franchises are characterized by their excellent service and quality in products, which are provided by food chains recognized worldwide.

Fast food restaurants offer the opportunity of ordering in the facilities or in a drive-thru, presenting an alternative of selection according to customers' preferences. Is well known that these companies invest great sums of money and time in the development and application of new services, products, techniques and equipment used or that will be used in the future. The Burger King Corporation, as other fast food restaurants, controls the processes of development and growth in each one of the franchises they administer.

As expected, each purchase can have as a result a good service received, which leaves a consumer with a high satisfaction level; or in the contrary, a consumer may experience negative perception of the received service.

2.4. Service Quality Dimensions in Mexican Restaurants

A restaurant is a commercial enterprise where a menu is offered, a service and quality attentions are provided within a cordial and varied styles environment. The term derives from the Latin *restaurare* that means recover or restore. According to Talavera (2009) a restaurant receives multiple names, according to the environment, type of food and the attention disposition.

The restaurant's industry must take into consideration that the activity includes a tangible side that is focused in the preparation of the food served and a non-tangible side, which is integrated by the customer. The importance in the service can be perceived in different manners among the consumers, who take into consideration other aspects that complement the activity, as the speed of service and dishes' vary. The activities include food preparation for immediate consumption, taking place within the facilities, with or without table service or outside the restaurant, (Anker and Batta, 2000).

Trujillo and Vera (2007), determined through a study that 25 variables constitute the quality service in México' restaurants industry, which are grouped by content similarity in six dimensions: facilities - how pleasant and comfortable the place is perceived; accessibility - how easy is to arrive to the restaurant; personnel, - how amiable and proficient personnel attend customers; environment - how pleasant is the atmosphere or the environment perceived in the establishment; food - how well prepared and portioned are the dishes; dependability and honesty - how often the customer receives the same service.

In Table 1 are shown the dimensions, variables and definitions that integrate the quality service in México. For this investigation, these factors were adapted or adjusted to each one of the dimensions of the Servperf measurement tool that was designed to be applied to the hamburgers sector consumers.

Table 1. Dimensions, variables and definitions of quality service

Dimension	Variable	Definition
Facilities	Internal and external appearance (colors, design, decoration) Comfort Cleanliness Location	Physical characteristics that the customer perceives at a glance such as: colors, decoration and design. Comfortable furniture and spaces. Cleanliness in facility and tableware. Easiness to reach the restaurant.
Accessibility	Parking Lot Payment alternatives Courtesy and welcome Proficiency and ability	Easiness and safe car parking. Payment alternatives and facilities Welcome greetings received by customers Personnel's level of knowledge of the food.
Personal	Presentation Promptness Empathy	Personnel appearance. Personnel level of proficiency to attend customers' needs. Perception of familiarity, needs' understanding, reliability, attitude.
Environment	Audiovisual ambiance Lighting Smells Room temperature Aroma Variety	Background music, TV programs. Lighting according to the type if restaurant. Smells perception at the moment of arrival. Room's temperature is manipulated for more comfort. Perception of a pleasant aroma. Options to choose.
Food	Taste Presentation Food hygiene Food freshness Temperature Prestige	Food and beverages must have a pleasant taste. Food visually attractive Foods look clean and disinfected. Foods with a pleasant appearance and keeping its natural properties. Foods with the proper temperature Clients' perception of a restaurant with a prestige.
Consistency and Honesty	Accomplishment Attention to complaints	The clients received what they ordered and have in inventory what is offered. Fast and adequate solution to client's complaints.

Source: Trujillo, A. and Vera, J. (2007). Factors that constitute service quality for Mexican consumers in restaurants. 42 Annual Assembly of CLADEA. Miami, U.S.A.

3. Methodology

The present investigation is based on the analysis of the global satisfaction index in hamburger for consumers, regarding the service quality provided by restaurant chain Burger King, which has a high participation in the industry and the fast food sector.

3.1. General Objective

To analyze the perception of quality service and its relation to the global satisfaction index that consumer's demand in the hamburgers' fast food sector, of the company Burger King in Hermosillo, Sonora.

3.2. Investigation Questions

The following two investigation questions were generated:

1. What is the level of satisfaction of Burger King's clients or customers?
2. What are the perceptions of the clients or customers about the service quality provided by Burger King for each evaluated dimension?

3.3. Hypotheses

For the purposes of this study, the following hypotheses were formulated:

H₀: The variables of tangibility, reliability, responsiveness, assurance and empathy do not predict the global satisfaction index in Burger King's quality service.

H₁: The variables of tangibility, reliability, responsiveness, assurance and empathy predict the global satisfaction index in Burger King's quality service.

3.4. Variables Identification

The following independent variables of the study were identified:

- (a) Tangible elements (X_1), the appearance of physical installations, equipment and communication materials.
- (b) Reliability (X_2), the ability to perform the service promised in a careful and reliable manner.
- (c) Responsiveness (X_3), the willingness of employees to help the customers and carry out the service.
- (d) Assurance (X_4), the knowledge and care shown by the employees and their abilities to inspire credibility and assurance.
- (e) Empathy (X_5), individualized attention that the company offers to consumers through its employees.

The dependent and defined variable determined for this study was the service quality global satisfaction index, explained through the direct relation and importance order of independent variables.

4. Research Context

To reach the general objective of the study it was considered an investigation with a quantitative and documentary approach, as well as correlation, since the independent variables were analyzed and evaluated with five dimensions, and how they were related with the dependent variable, in order to obtain statistically significant results that allow the explaining the studied event.

Additionally, the investigation designed was a non-experimental type, since the study variables were not manipulated, but studied as they occurred in their natural context. Furthermore, it was a transversal investigation, considering that data was obtained in the timeframe from October to December of 2014.

4.1. Data Collection and Sample

The sample was composed by all the people, 18 years or older, that in the period of October to December of 2014 made at least one consumption in any of Burger King's establishments in Hermosillo, Sonora.

Taking into consideration the data from the 2010 Census of Population and Housing, applied by the Institute of Statistics, Geography and Informatics (INEGI by its acronym in Spanish) in Hermosillo live 468,765 persons with the characteristics mentioned above. From this data, a calculation for a simple random probability sample was realized.

According to Santesmases (2009) the sample calculation from a known and finite population is obtained from Formula 1. In this sense, the sample gave a result of 385 subjects, with a confidence level of 95% and a permissible error of $\pm 5\%$; which implied that 95% of the times that data was measure, it was in the interval of $\pm 5\%$ in relation to the data observed in the questionnaire.

$$n = \frac{N \times Z_{\alpha}^2 \times p \times (1 - p)}{e^2 \times (N - 1) + Z_{\alpha}^2 \times p \times (1 - p)} \quad (1)$$

where:

n = Sample size to be calculated;

N = Population size;

Z_{α} = Deviation of median value accepted to reach the desired confidence level, that for a 95% level, the coefficient value of $\alpha = 1.96$;

E = Maximum permissible error;

P = Expected proportion

The sample selection in the group of study was made through a simple random probability sample, in such a way that each subject had the same probability of being chosen to answer the questionnaire. In Table 2 the methodological tabulation used in the investigation is shown.

Table 2. Methodological tabulation used in the investigation

Universe	Geographical Scope	Field Work	Sample Error	Confidence Level	Pilot Test	Sample Obtained	Technique
Fast food consumers, hamburgers sector	Hermosillo, Sonora	From October to December 2014	Maximum permissible error for the global data of $\pm 5\%$	95% $Z^2_{\alpha} = 1.96$	Yes Application to 40 customers	385 customers	Direct application through a questionnaire and processed in the SPSS v21

4.2. Measurement and Research Instrument

The questionnaire used in this study is based on the Servperf model, and measured the customer's satisfaction applying only the perception, through 20 items grouped in 5 dimensions and using Likert answers with five options. In Table 3 the used Likert scale is shown. The questionnaire was structured by 22 items and adapted to the environment conditions where the Burger King Chain operates.

Table 3. Likert scale used in the measurement instrument

Totally disagree	Disagree	Neither agree nor disagree	Agree	Totally agree
1	2	3	4	5

4.3. Reliability Analysis

To evaluate the reliability of the measurement instrument it was developed an internal consistency analysis through Cronbach's alpha. It is an index that takes values between 0 and 1, used to verify if the instrument is reliable and performs with stable and consistent measurements (Santesmases, 2009). Cronbach's alpha estimates the lower limit of the reliability coefficient and it is expressed through Formula 2.

$$\alpha = \left(\frac{K}{K-1} \right) * \left[1 - \left(\frac{\sum_i S_i^2}{S_{sum}^2} \right) \right] \quad (2)$$

Where k is the number of items in the test; S_i^2 is the items variance (from 1...i) and S_{sum}^2 is the total test variance. This means that the reliability depends on the test length and the covariance among its items (Santesmases, 2009).

It is important to mention that it was decided to apply a pilot test to 40 customers, with the purpose of measuring the questionnaire's internal consistency. In the first version, the test was integrated by 22 items distributed in five dimensions and after being undergone to Cronbach's alpha validity test, the instrument was redesigned to 20 items, as it is presented in Table 4.

Table 4. Items and dimensions of final questionnaire

Dimension	Initial Item	Cronbach's Alpha before eliminating the item	Item eliminated	Cronbach's Alpha after eliminating the item	Total Cronbach's Alpha (20 items)
Tangible	1-5	0.740	5	0.810	0.946
Reliability	6-10	0.903	None	0.903	
Responsiveness	11-14	0.886	None	0.886	
Assurance	15-18	0.846	15	0.869	
Empathy	19-22	0.888	None	0.888	

The data analysis was done by applying the *Statistical Package for the Social Sciences* (SPSS v21) software. The validity was determined using the main components analysis with the Varimax rotation method, which indicated that with three factors or components explained the 66.42% of the total variance.

The sample applicability for the factors extraction was confirmed through the Kaiser-Meyer-Olkin (KMO) construct validity test and the Bartlett's sphericity test, which was significant ($P < .000$); that indicates association between the variables, thus makes sense to apply the factorial analysis, while the value KMO was 0.944 that places it above the minimum acceptable value (0.5) which reinforce the previous, since it showed that the studied variables are closely associated and correlated between them, this allows to reduce the number of factors, and therefore, shows the convenience of using the questionnaire for the purposes of the investigation (Uriel and Aldas, 2005).

5. Analysis and Results

In Table 5, the socio-demographic data of the customers that formed the population sample is shown.

Table 5. Respondents' socio-demographic information

Gender		
Gender	Frequency	Percentage
Male	165	42.9 %
Female	220	57.1 %
Age range (years)		Frequency
18-25		229
26-35		89
36-45		39
46-55		11
56 or more		8
NC		9
Education Level		
Studies	Frequency	Percentage
Basic Education	20	5.2
Middle Education	215	55.8
Undergraduate	112	29.1
Graduate	17	4.4
NA	21	5.5
Occupation		
Status	Frequency	Percentage
Student	215	55.8
Employee	80	20.8
House holding	26	6.8
Employer	11	2.9
Retired	4	1.0
Dealer	14	3.6
NA	35	9.1

As a first approach to the results obtained, it is concluded that the population more involved were women with a 57.1% of participation, besides being concentrated in the age range of 18-25 years, which represents a 35.8% part if respondents. Most of them have a middle education level with a 48.31% percentage; likewise, the 31.9% are students of different levels.

The evaluation of the global satisfaction perceived by the consumers of Burger King Products is shown in Table 6, with the answers to question number one of the investigation; while the answer to question number two, the result of the satisfaction level for each quality dimension evaluated is shown in Table 7.

Table 6. Global satisfaction level of perceived service

Satisfaction level		Frequency	Percentage
Valid	Unsatisfied	66	17.1
	Satisfied	239	62.1
	Pleased	80	20.8
	Total	385	100.0

Table 7. Global satisfaction level by each quality dimension evaluated

Dimension evaluated	Satisfaction level perceived by the customer		
	Unsatisfied	Satisfied	Pleased
Tangible	67 (17.4%)	253 (65.7%)	65 (16.9%)
Reliability	66 (17.1%)	233 (60.5%)	86 (22.3%)
Responsiveness	63 (16.4%)	247 (64.2%)	75 (19.5%)
Assurance	85 (22.1%)	235 (61.0%)	65 (16.9%)
Empathy	80 (20.8%)	240 (62.3%)	65 (16.9%)

It can be observed very similar results among the five quality dimensions evaluated by consumers; however, for the dimensions of assurance and empathy there is a higher level than in the others, regarding the unsatisfied level, which represents an opportunity area for an improvement in the offered service.

It is observed an index of service global satisfaction of 69.27%, which means that customers are satisfied with the service received.

5.1. Linear Regression Model

Formula 3 represents, in a general manner, the linear regression model that indicates the lineal dependency of the response variable (Y) respect to various explanatory variables X_1, X_2, \dots, X_5 .

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon \quad (3)$$

where:

Y = Consumers' global satisfaction

B_0 = Constant model

$\beta_1 \dots \beta_5$ = Model's Betas

X_1 = Tangible

X_2 = Reliability

X_3 = Responsiveness

X_4 = Assurance

X_5 = Empathy

ε = Error or residual

Following, in Table 8, it is presented the overview of the regression model obtained from the method of introducing variables.

Table 8. Overview of the regression model

Model	R	R ²	R ² corrected	Standard error of the estimate	Statistics changes				Durbin-Watson	
					Change in R ²	Change on F	gl1	gl2		Significant change in F
1	0.912 ^a	.832	.829	5.534	0.832	374.173	5	379	0.000	1.962

a. Independent variable: (Constant), Tot_Dim5, Tot_Dim1, Tot_Dim2, Tot_Dim4, Tot_Dim3

According to the regression model, the coefficient of determination (R²) explains the 82.9% of the total variance of the dependent variable. The same way, the score of the Durbin-Watson test indicates the existence of independence among the residuals (1.962) since the value is between the range of 1 to 3.

5.2. ANOVA of the Regression Model

The ANOVA of the model illustrates that this significantly improves the prediction of the dependent variable, by giving as a result $F = 374.173$; $P < .001$, accepting the alternative hypothesis H_1 , which indicates that the variables of tangible, reliability, responsiveness, assurance and empathy predict the satisfaction global index in Burger King's quality service. The ANOVA is shown in Table 9.

Table 9. ANOVA's linear regression model

Model		Sum of squares	Gl	Root mean square	F	Sig.
1	Regression	57291.211	5	11458.242	374.173	.000 ^a
	Residual	11606.051	379	30.623		
	Total	68897.262	384			

The coefficients of *t* values showed that the variables contribute significantly to the model, which indicates that the values obtained, can be generalized to the population, since $P(\text{value}) < 0.001$. According to statistics of collinearity, they indicated that there are no multicollinearity problems among the independent variables; since the values of the variance inflation factor (FIV) are lower than 10, that is, the values results were between 1.436 and 1.834, while all the tolerance values were higher than 10, as it is shown in Table 10.

Table 10. Multiple linear regression model of collinearity statistics

Model		Not standardized coefficients		Typified coefficients	t	Sig.	Collinearity statistics	
		B	Standard error	Beta			Tolerance	FIV
1	(Constant)	22.149	1.244		17.809	0.000		
	Tot_Dim1	5.714	0.577	0.250	9.898	0.000	0.696	1.436
	Tot_Dim2	6.420	0.595	0.301	10.796	0.000	0.574	1.743
	Tot_Dim3	5.055	0.639	0.226	7.914	0.000	0.545	1.834
	Tot_Dim4	4.017	0.589	0.187	6.818	0.000	0.592	1.689
	Tot_Dim5	4.746	0.621	0.217	7.642	0.000	0.550	1.819

A condition index between 10 and 20 points indicates that there is no collinearity problem as it is shown in Table 11.

Table 11. Multiple linear regression model of collinearity statistics

Collinearity ^a Diagnose									
Model	Dim	Coefficient	Condition index	Variance proportion					
				Constant	Tot_Dim 1	Tot_Dim 2	Tot_Dim 3	Tot_Dim 4	Tot_Dim 5
1	1	5.784	1.000	0.00	0.00	0.00	0.00	0.00	0.00
	2	0.058	10.010	0.12	0.34	0.00	0.00	0.38	0.10
	3	0.046	11.158	0.08	0.12	0.53	0.16	0.09	0.08
	4	0.042	11.786	0.62	0.27	0.00	0.00	0.08	0.28
	5	0.036	12.612	0.18	0.27	0.00	0.00	0.44	0.54
	6	0.034	12.994	0.00	0.01	0.47	0.84	0.01	0.01

a. Dependent variable: global satisfaction

6. Discussion and Conclusion

The failure or success in companies depends, in a great measure, to their ability in identifying the factors that are important to customers, from the perspective of service quality. Being able to recognize the factors that influence the quality perception of customers when they receive a service, it can generate a clear advantage for the company at the moment of competing in markets more and more globalized, where there are a great amount of attractive services in different dimensions and focused to more prepared and demanding clients.

According to the multiple linear regression model proposed for the Burger King chain, fast food restaurant in the hamburger's sector, the explanatory variable with the highest influence in absolute values over the explained variable is the Reliability (X_2), since its standardized *Beta* coefficient is equal to 0.301 that represents the highest quantity in absolute value, followed by the variables Tangible (X_1) with a *Beta* coefficient value of 0.250; Responsiveness (X_3) with 0.226; Empathy (X_5) with a value of 0.217 and finally; Assurance (X_4) with a coefficient value of 0.187. The data regression equation is displayed in Formula 4:

$$Y = 22.149 + 5.714*(X_1) + 6.420*(X_2) + 5.055*(X_3) + 4.017*(X_4) + 4.746*(X_5) \quad (4)$$

Based on the above mentions, it is important to continue offering the service in a careful and reliable manner, since the satisfaction of the customers' expectations and needs constitute the basis for the correct implementation of a continuous improvement system in the company. However, the rest of the independent

variables cannot be ignored because each one of them contributes to the model, and therefore, to the global satisfaction service quality.

The scale permits to measure the perceived quality in the fast food restaurant (hamburgers) by the customers of Burger King and becomes an analysis instrument that reveals what is important from customers' perspective, and by confronting them, being able to know what are the company's weakness and strengths, in order to manage and implement the pertinent measures for an improvement.

7. Study Limitations/ Research Future Directions

Some future lines of investigation would be to apply the model to other economic or industry sectors where companies participate and compete for customers' total satisfaction, as well as their loyalty. We have applied this study only on the fast food restaurant –hamburgers sector- and thus we cannot generalize the results that we have acquired on all fast food sectors.

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Are Housing Markets Decoupled? A Case Study of Residential Real Estate Affordability in Austria

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Real estate arguably forms the most important asset to most households and the basis for their wealth. Around this context a model has been set up testing the relative affordability of real estate for the median household in Austria and the consequences of lower borrowing costs between 2004 and 2013 by vintage year. In this paper the hypothesis that the significant decline in base interest rates is not sufficient to offset the relative affordability loss caused by declining net household incomes and the simultaneous increase of real estate prices. To test this hypothesis a model has been set up comparing two different Housing Affordability Indices – one including and one excluding financing effects, having been compared via a multi factor model. Based on this calculation the author finds decreased base interest rates to offset relative affordability losses by only approximately 50%, verifying the hypothesis. The paper therefore argues for a potential decoupling of the residential housing market in Austria.

Keywords: Household Income, Taxation, Real Estate, Interest Rates, Debt Service, Austria, Housing Affordability

JEL Classification: M20, M21

1. Introduction. Declining Real Estate Affordability a Global Phenomenon?

Real estate affordability is a vast field of research spanning from the late 18th century, documenting housing costs for worker to highly complex regression models capturing pricing and affordability trends in the recent years. What appears to be worthwhile examining, is that there seems to be a more global trend of depressed housing affordability, comparing the research done by Lin et al. (2014) for Taiwan, Radzimski (2014) for Poland or Kallakmaa-Kapsta and Kolbre (2013) examining the Estonian housing market, all pointing to declining real estate affordability. Despite the findings of three researchers do not constitute the existence of a global trend, the author's interest arose to examine the relationship between household income and real estate prices in Austria, to see if a comparable trend could be also found in this market. The paper therefore tries to develop a model that measures the affordability of real estate housing prices in Austria

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Article History:
Received 11 August 2015 | Accepted 26 August 2015 | Available Online 9 September 2015

Cite Reference:
Philipp, F., 2015. Are Housing Markets Decoupled? A Case Study of Residential Real Estate Affordability in Austria. *Expert Journal of Business and Management*, 3(2), pp.129-139

between 2004 and 2013 through a price-to-income measurement and further explore the impact of base interest rate changes on this affordability.

2. Literature Research – Theory and Empirical Background

2.1. Income Hypothesis – Life-cycle Permanent

Tracking income-consumption behaviour theory in social science ultimately leads to the income hypothesis by Keynes (1936), upon which the modern consumption theory, the life cycle permanent income theory, was built. The theory has been prominently tested by Hall (1978) and is still in use by highly regarded research institutions, such as OECD (2004) in their study on housing markets, wealth and the business cycle. But next to consumption functions in theory, actual spending behaviour – notably for housing expenditure – has been tracked since the 18th century.

2.2. Measuring Affordability in the Context of Real Estate - Expenditure to Income

Since the measurement of income is obviously one of the key criteria for assessing the affordability of real estate, we shall explore the findings of past researchers on the measurement of those. Herman Schwabe and Ernst Engel, identified as one of the forefathers of income to housing expenditure research by Stigler (1954), stated an inverse relationship between household income and expenditure for housing. Looking at the spending on rent to household income, a general increase on such spending might be argued over time. While the expenditure was between 5.3% and 4.3% in 1793 for English working families, it had increased to between 8.3% and 9.0% for Belgian workmen's families in 1853, as summarised by Stigler (1954). Despite it might be argued that this is an invalid conclusion on tendencies, Gilderbloom (1985) finds that professional landlords – in his research this group has been defined as those owning more than 50 rental units – apply a common rule of thumb of 25% of household income to housing costs, when assessing tenant quality.

Stone's (2006) finding that this value has been increased further from 25% up to the early 1980's to 30% thereafter. Gan and Hill (2009) find that a 28% cost-to-income ratio being applied by the National Association of Homebuilders in the US. Lin et al. (2014) compare the household's actual budget to purchase a home with the household's permanent income, creating a price-to-income ratio. Conceptually along this lines, despite considering a different format, Radzimski (2014) and Trojanek (2013) also take a housing price to household income ratio to measure the affordability of residential real estate – for their respective studies on Poland. Kallakmaa-Kapsta and Kolbre (2013) also use a household income-to-price ratio – not accounting for a household's spending behaviour – due the lack of data – while examining the Estonian residential real estate market.

We can therefore conclude that the approach to estimate the amount of spending on housing by the respective households might be criticised but even as the latest research shows – at least to the author's knowledge – there is no other approach than to simply ignore the factor of disposable income for housing or apply the rule of thumb that seems to be widely applied by real estate tracking indices and professional landlords.

Hulchanski (1995), reviewing the housing affordability in the context of housing expenditure to income ratios, identifies six sectors of usability for cost to income relationships and its' validity. Rejecting four out of the six areas examined, he finds it a "valid and reliable quantitative indicator in housing research and analysis, depending on the questions asked and the methods used". Despite these aspects, he argues that the "housing outlays" are rather a measurement of liquidity rather than of assets, and he, in principle, finds it a valuable tool to research on trends in the real estate market, measuring comparative positions within. On his liquidity argument the author disagrees since the liquidity is the key determinant of the asset acquisition both in the saving phase, when equity is accrued for the down payment at asset acquisition, and at the time of purchase when the liquidity defines the mortgage amount assumed by the lender to be serviceable by the respective household. Following this logic it actually remains the only relevant determinant for the mortgage lender during the "exploitation phase" when the mortgage granted needs to be served.

Around this context Gyourko and Linneman (1993) have been examining the relative affordability of home ownership in the US over a period of 30 years, between 1960 and 1989. They find that between 1960 and 1974, despite real home prices have increased, no affordability issued existed due to the strong real wage increase. Despite this might arguably have a more historical character due to the time lag, the author considers this a significant finding, since this seems to point into the direction that real home price increases may only be met by affordability during simultaneous strong wage increases.

The question to which extend (if at all) interest rates may offset reverse or rather diverging tendencies, shall be examined by this paper. Further Gyourko and Linneman (1993) observe that despite the then relative

low interest rate levels, a significant increase in house ownership was not recorded, pointing to the direction that low interest rates might not be sufficient to offset real wage declines (and consequently keep affordability stable). Following this logic one might argue that capital gains (or compound interest driven) may outperform labour income over time. Finding what the appropriate housing spending ratio versus the household income is, literature offers a narrow range of figures. Mortgage underwriter in the US as found by Stone (2006) typically apply a range from 25% to 35% depending on the household's other debt obligations. The range of 25% to 30% are figures widely found by empiric approaches to be applied in real life estimation to determine household's ability to serve household spending.

Kutty (2005), also researching cost-to-income ratios, found that lenders advise households not to increase debt service (i.e. interest and principal repayments) to no more than 30% of household income net of taxes, in average in line with the 25% to 35% findings of Stone (2006). Further Kutty (2005) argues that this seems to be in line with many HUD programs (the US Department of Housing and Urban Development – HUD), which assume housing cost burdens at the level of 30%. This is not an undisputed approach, for example, by Hulchanski (1995) correctly claiming that there is no scientific repeatability in simply observed ratios. Despite Hulchanski's claim (1995) that fixed ratios have rather the taste of "allowing" households to spend within certain band widths rather than to research the actual spending behaviour, the author would like to take on a different view on this matter. His claim that the percentage of household income spent on housing in Ontario according to the 1991 census shows no pattern and in no way supports the 25% to 30% range, seems only correct at a first glance. Taking a weighted average of the different spending brackets shown in Hulchanski's research (1995), assuming 19% for the lowest and 51% for the highest bracket - otherwise taking averages for all other brackets - a value of 27.78% can be computed (as done by the author), at least from this perspective, suggesting to be in line with the 25% to 30% range. Generally, however, Hulchanski (1995) agrees to the perspective that empirical found evidence does not create a scientific law (especially since this value has sharply increased over history comparing the findings of Stigler (1954), Gilderbloom (1985), Hulchanski (1995) and Stone (2006), nevertheless it seems - at least noteworthy - that the 25% - 35% range is in place and use for the past decades.

Reviewing the Australian real estate market, more concretely the housing market in Sydney, between 1996 and 2006, Gan and Hill (2009) find that there is a distinct difference between the *purchase affordability*, defined as the ability of a household to borrow sufficient funds for a housing purchase and the *repayment affordability*, reviewing the ability of a household to service its' debt obligation from the mortgage. For this reason the paper at hand combines the debt saving and the repayment phase to capture the full "investment cycle". Gan and Hill (2009) argue that purchase affordability, due to the loosening borrowing standards, has significantly increased over this period, pointing to an obvious cause-effect relationship between lending availability, interest rates and affordability, the key topic of this paper.

Arguing around this context, it could be claimed that the actual affordability is defined not as the disposable income but rather as the disposable income available for real estate investment (or purchase of such assets, more concretely). As discussed earlier, around this context. Stone (2006) finds that those levels have actually increased over time, arguing that the housing cost to income ratio has developed from 25% until the 1980s, to 30% since then. One of the reason for the increase of this ratio might be the high base interest rate environment found in the 1980s and the consequent need to accommodate for higher interest rate costs. Bourassa (1996) is also referring to the existence of a common measure of housing affordability as housing costs not exceeding 30% of the household's income. Quingley and Raphael (2004) note that the index produced by the National Association of Realtors (NAR) assumes a 25% disposable income margin of the median monthly household income to define real estate purchase power assuming a fixed rate loan applying current interest rates. Further, they note that the National Association of Home Builders (NAHB) compares a 28% disposable income margin of a median household with the affordability of dwellings sold for such a margin.

Given that the initial down payment (and the affordability to do so) is a significant criterion not only to credit worthiness and the subsequent ability to service debt, we shall give this factor a closer look. Chomsisengphet and Pennington-Cross (2006) finding around this context that the two factors mostly associated with borrowing costs, despite in the context of subprime lending, is credit history and down payment ability. Both factor arguably significantly determine housing affordability since they not only determine the risk margin above the reference rate but also the required down payment to take out the loan (and vice-versa). Phrasing this differently the potential borrower's affordability of real estate heavily depends on the interest (or risk) margin and the down payment requirement.

Around the context of down payments, Liu and Skully (2005) find that households purchasing houses with a down payment ration of less than 20% of the real estate purchase price are required to apply for a Lenders Mortgage Insurance (LMI) in Australia. In other words, in order to become applicable for real estate

borrowing, lending institutions seem to require a minimum down payment of 20% or otherwise require additional security against the lending, i.e. the insurance policy. Looking into literature the next equally important determinant of affordability is the average loan length or maturity of the loan provided to the real estate buyer. Gan and Hill (2009) for example took a dynamic approach by vintage years in their Affordability at Risk research, taking the 20 year maturity found by Bourassa (1996) for the period 1989/1990 in Australia, combining it with the OECD (2004) value found for 2004 of 25 years and the 2006 value of 30 years found by Brischetto and Rosewall (2007). This ranges seem to be in line with the findings of OECD (2004) for Austria, the research subject of this paper, where loan terms of 20 – 30 years are found to be typical. Loan to Value (LTV) ranges also seem to shift, Bourassa (1996) for example finds an LTV of 75%. Radzimski (2014) even finds even higher LTVs of 80-90% for the residential real estate market in Poland. While OECD (2004) records typical LTVs for Austria at 60% and a maximum of 80%.

Kutty (2005) further finds that homeownership with low or none – due to government assistance – down payment on housing purchases accumulate no or little wealth from real estate, i.e. not participating in the underlying wealth increase (mostly) found from real estate investment (even if done so primarily for housing purposes). This seems to be a significant finding, in the authors view, since this is not only showing a reduced affordability of real estate for low income households in the first place but potentially even a source of suppressed relative wealth compared to high income households, since low income households would have to carry the same – if not more for the reason of higher repayment risk – financing, i.e. interest rate costs, but during the same period participate less in the value appreciation from the underlying asset. Phrasing this differently, the phenomenon found could be described as a negative spiral of compound interest rate working against low income households. The author therefore finds from the literature review that

- i. using an income-to-spending ratio to estimate housing expenditures seems to be an accepted, despite of course not undisputed, approach;
- ii. there seems to be limited impact of interest on the affordability;
- iii. the driving factor of affordability deprivation may be lower incomes.

2.3. Measuring Affordability in the Context of Real Estate – Real Estate Prices

The other parameter to be reviewed in this context is the housing price index that was used in empirical research. Gan and Hill (2009) take the house prices in Sydney recorded by the Australian Property Monitors (APM), while trimming the top and bottom 0.5% arguing for a greater prevalence of the data entry there. Lin et al. (2014) using a housing demand survey to estimate housing prices. Using data from the Central Statistical Office of Poland (CSO) to estimate housing prices for the purpose of their study. Trojanek (2013) collected the asking prices for the biggest cities in the country of research – Poland – and calculated an index reflecting the average real prices per square meter per dwelling with a floor space of up to 150m². Kallakmaa-Kapsta and Kolbre (2013) measuring the real estate market by (i) residential buildings defined as at all or at least half being used for permanent residence and (ii) apartments. Kutty (2005), Gyourko and Linneman (1993) use the Census of Population and Housing and the American Housing Survey, published by the Bureau of the Concensus, which collects home prices reported by owners. Chomsisengphet and Pennington-Cross (2006) use the LoanPerformance ABS security data base of subprime loans to estimate the real estate market for their purpose. In other words estimating real estate prices ranges from self-collected and constructed indices to statistical resources. The research at hand combines research reports and statistical data base sourcing for the purpose of estimating housing prices.

3. Research Design, Methodology, and Targeted Analysis

3.1. Research Design and Method

The research design of this paper is set to understand first the impact of changes in net household incomes in comparison with the changes in real estate prices in Austria. Further it is the aim to then understand the impact of changes in the base interest rate or reference rate on the affordability of real estate in relation to the household income.

The research method chosen is a comparative research widely used in comparing real estate market impacts, such as proposed by Hulchanski (1995) for analysing trends. In more recent research Kallakmaa-Kapsta and Kolbre (2013), conducting a comparable analysis as done in this paper but for the Estonian real estate market. They calculate a Housing Affordability Index (HAI) comparing an average mortgage loan repayment based on the average purchase price of a dwelling to the average full time income. The research method proposed in this paper will go one step further, also accounting for tax and housing spending by household to calculate a Cash Flow Available for Debt Service per median household based on which a

maximum loan amount and consequently the affordability shall be calculated. Further this paper then will include the saving phase based on the median net income into the calculation to come up with a full life-cycle real estate measurement, based on which a HAI for median sample house hold in Austria shall be calculated, one taking financing effects into account, one not considering those impacts. As a next step a coefficient to measure the change in net household income and change in real estate prices versus the change in base interest rates shall be calculated for Austria for the period between 2004 and 2013.

4. Research Model

4.1. Comparative Model - Finding the Base Interest Rate Coefficient

Based on the research interest in the effect of base interest rate changes on the affordability of real estate in the Austrian market a basic hypothesis shall be found to be tested through a comparative model. The author argues: The change in base interest rates - and its' consequent effect on the borrowing amounts and costs - is not sufficient to off-set the change in post-tax median household income in relation to the price changes in the residential real estate market in Austria. The model pictured in Figure 1 shall test the above hypothesis and is split into four and three factors respectively, which are determined by the variables x_1 to x_{12} estimating: the household revenue, Factor 1, the household expenditure before housing costs, Factor 2, the financing parameters for a mortgage loan, Factor 3, and the price for a standardised real estate object, Factor 4. The factors 1-4 then further determine the down payment $X_{A/B}$ and loan amount Y_A in order to acquire such asset. Depending on the case with or without financing the loan amount X_A is or is not taken into account. Based on $X_{A/B}$ and Y_A it is then further translated into the Housing Affordability Indices (HAI), Z_A and Z_B , while $f(Z_A) = X_A + Y_A$, $f(Z_B) = X_B$ and further Z_A and Z_B are then put into relation to the household income and on that bases translated into rebased indices, which are used to calculate a coefficient β between both variables in order to measure its relative relationship over the testing period between 2004 and 2013.

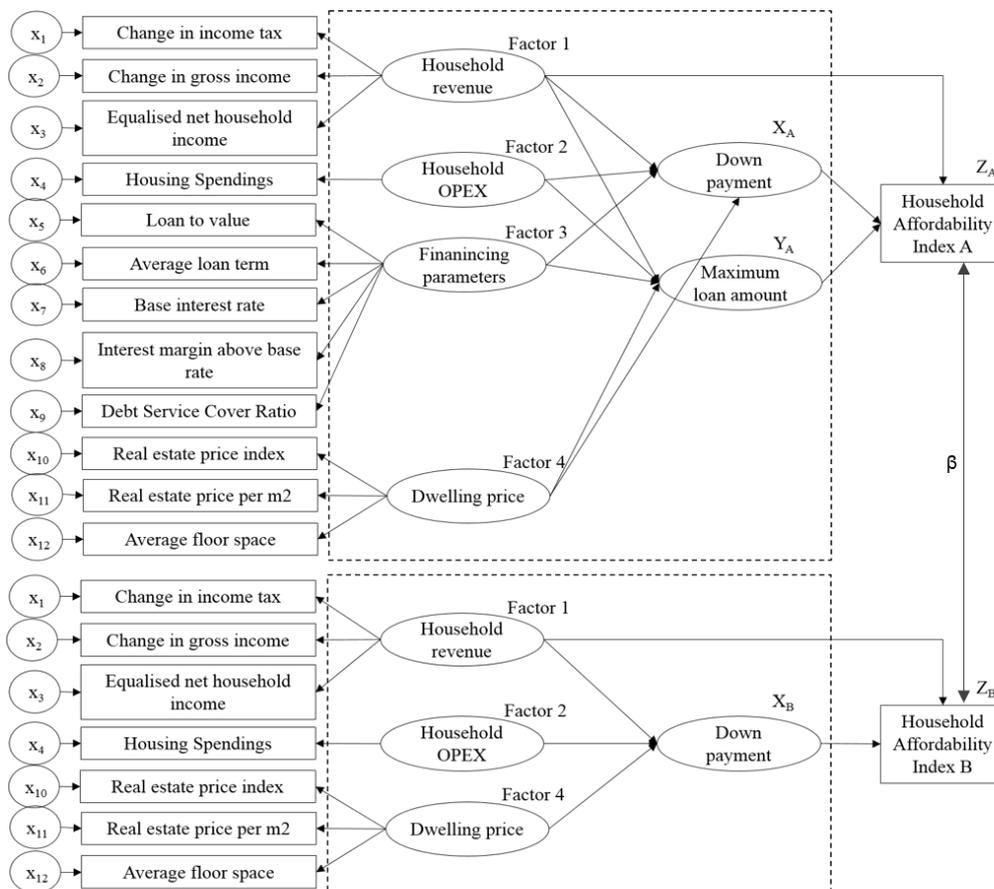


Figure 1. Comparative model

Source: Author's compilation

Legend for the comparative model:

$x_1 \dots x_{12}$ = latent exogenous variables (measurement variables), $X_{A/B}$, Y_A , $Z_{A/B}$ = dependent structural variables,
 β = coefficient to measure the relative delta

5. Empirical Analysis

5.1. Factor 1: Household “Revenue” or Household Income

Household income or household “revenue” has been estimated by the input parameters x_1 to x_3 , while x_1 , the change in income tax, and x_2 , the change in gross income, have been obtained from Statistics Austria and used to calculate a net income index rebased to the first year of the observation for the purpose of this paper, i.e. 2004. Further the equalised net median household income obtained by Statistics Austria for 2013 has been on the basis of that index recalculated back to 2004 on an annual basis, see Table 1.

Table 1. Household Income

Trait	Year									
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Change in Income Tax	-	-0.90%	7.80%	7.90%	8.40%	-7.10%	3.90%	6.00%	7.00%	4.80%
Change in Gross Income	-	3.40%	4.70%	5.00%	5.20%	1.70%	2.50%	3.60%	4.30%	2.90%
Net Income Change post Tax	-	4.30%	-3.10%	-2.90%	-3.20%	8.80%	-1.40%	-2.40%	-2.70%	-1.90%
Net Income Index	100.00	104.30	101.07	98.14	95.00	103.36	101.91	99.46	96.78	94.94
Equalized Net Household Income	22,919	23,949	23,229	22,575	21,875	23,985	23,654	23,100	22,492	22,073

Source: Austrian Statistics, Author’s calculation

5.2. Factor 2: Household “Operational Expenditure (OPEX)” or Household Spending Before Housing Expenditure

The household spending before housing expenditure has been defined as an inverse relationship, $(1-n)$, of the input variable x_4 , housing spending, which has been estimated in line with literature findings at 30%, see literature review Stone (2006) and others. Based on this, and taking the calculations from Factor 1 into consideration, a Cash Flow Available for Debt Service (CFADS) has been calculated for the median household by vintage year, see Table 2.

Table 2. Household cash flow available for debt service (CFADS)

Trait	Year									
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Equalized Net Household Income	22,919	23,949	23,229	22,575	21,875	23,985	23,654	23,100	22,492	22,073
Net Spending before Housing Costs	-16,044	-16,764	-16,260	-15,802	-15,312	-16,790	-16,558	-16,170	-15,745	-15,451
Household CFADS	6,876	7,185	6,969	6,772	6,562	7,196	7,096	6,930	6,748	6,622

Source: Author’s calculation

Note: To estimate the households spending before housing costs, or defined as Operational Expenditure (OPEX) for the purpose, the author has used an estimate of 30%, see 5.2 Factor 2

5.3. Factor 3: Financing Parameters or the Mortgage Loan to Finance the Purchase

The mortgage loan has been defined by the input variables x_5 to x_9 , where x_5 , the loan to value (LTV) has been set at 0.8, the maximum value found for Austria in OECD (2004). The reason why the maximum value and not the typical values as found by this research of 0.6 has been used, is that it seemed more in line with the findings in other European countries by the same report all ranging between 0.75 and 0.8. A further reason why the author has been more “generous” on the LTV, is that the LTV in the model only functions as a plug to determine the maximum lending, while the actual loan amount is calculated using x_9 , a Debt Service

Cover Ratio (DSCR), which was set at 1.2x the Household CFADS, to determine the maximum loan amount, i.e. both the DSCR and the LTV are set equally for all vintage years and therefore have no direct impact on the relative measurement of the indices to be calculated. Stated differently, the maximum loan amount was estimated using the estimated household's cash flow – and arguably ability – to service the loan 1.2x leaving some cushion for unexpected payments by the household. Input variable x_6 , the average loan term has been set at 25 years, the average of the loan term found by OECD (2004) and in line with the findings in other European countries in this research, as can be found in the theoretical background section of this paper. The interest rate for the loan has been calculated by combining x_7 – the base interest rate – and x_8 – the interest margin above base rate. As a base rate, x_7 , the European Interbank Offer Rate (EURIBOR) has been used, recalculating average monthly base rates from the data provider Euribor Rates to annual values, see Table 3. A summary of the loan calculation by vintage year can be found in Table 4.

Table 3. European interbank offer rate monthly data recalculated to annual values

	Year									
Trait	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
January	2.28%	2.34%	2.86%	4.03%	4.73%	3.03%	1.25%	1.50%	1.94%	0.54%
February	2.25%	2.29%	2.90%	4.08%	4.33%	2.26%	1.23%	1.66%	1.75%	0.62%
March	2.09%	2.34%	2.99%	4.08%	4.38%	2.03%	1.22%	1.77%	1.60%	0.55%
April	1.98%	2.34%	3.25%	4.19%	4.74%	1.80%	1.21%	2.01%	1.41%	0.54%
May	2.23%	2.20%	3.31%	4.30%	4.95%	1.72%	1.24%	2.14%	1.30%	0.51%
June	2.33%	2.14%	3.37%	4.47%	5.10%	1.63%	1.26%	2.14%	1.23%	0.48%
July	2.39%	2.09%	3.51%	4.52%	5.42%	1.50%	1.32%	2.17%	1.21%	0.53%
August	2.35%	2.22%	3.54%	4.52%	5.36%	1.35%	1.42%	2.18%	0.94%	0.53%
September	2.28%	2.20%	3.64%	4.78%	5.33%	1.30%	1.41%	2.09%	0.80%	0.55%
October	2.37%	2.33%	3.75%	4.72%	5.51%	1.24%	1.46%	2.09%	0.69%	0.54%
November	2.30%	2.55%	3.83%	4.63%	4.85%	1.24%	1.54%	2.11%	0.62%	0.53%
December	2.28%	2.76%	3.85%	4.71%	3.92%	1.24%	1.53%	2.03%	0.57%	0.50%
EURIBOR Average	2.26%	2.32%	3.40%	4.42%	4.88%	1.69%	1.34%	1.99%	1.17%	0.54%

Source: Data provider EURIBOR Rates, Author's calculation

Table 4. Maximum loan amount

	Year									
Trait	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Household CFADS	6,876	7,185	6,969	6,772	6,562	7,196	7,096	6,930	6,748	6,622
Debt service cover ratio	1.20x	1.20x	1.20x	1.20x	1.20x	1.20x	1.20x	1.20x	1.20x	1.20x
Maximum debt service	5,730	5,987	5,807	5,644	5,469	5,996	5,914	5,775	5,623	5,518
Average EURIBOR	2.26%	2.32%	3.40%	4.42%	4.88%	1.69%	1.34%	1.99%	1.17%	0.54%
Loan margin above base rate	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
Average interest rate	3.76%	3.82%	4.90%	5.92%	6.38%	3.19%	2.84%	3.49%	2.67%	2.04%
Maximum Loan Amount	91,825	95,372	82,675	72,702	67,433	102,211	104,824	95,274	101,612	107,280

Source: OECD (2004), Data provider EURIBOR Rates, Author's calculation

5.4. Factor 4: Dwelling Price or Cost of a Home

The cost of a home has been estimated by the input variables x_{10} to x_{12} , where the real estate price index published by the Austrian National Bank since 2000 – x_{10} – has been rebased to 2004 figures to calculate the annual change in real estate prices in Austria, x_{10} has then been used to recalculate the average housing price per square meter for each vintage year, based on the value found by the Deloitte Real Estate Index (2014) for the year 2013, in the model the input parameter x_{11} – being the average transaction price of the new dwelling. The so found price per square meter has then been applied to the average floor space x_{12} . The average floor space for each vintage year was recalculated by a Compound Annual Growth Rate (CAGR), based in the observation of Statistics Austria in 2001 and 2011. A summary of the calculation of Factor 4, cost of a home, can be found in Table 5.

Table 5. Dwelling price

Trait	Year									
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Real Estate Price index (based 2000)	99.70	104.70	109.00	114.10	115.40	119.80	127.30	132.70	149.10	156.00
Change in Real Estate prices		5.00%	4.30%	5.10%	1.30%	4.40%	7.50%	5.40%	16.40%	6.90%
Real Estate Index rebased 2004	100.00	105.00	109.52	115.10	116.60	121.73	130.86	137.92	160.54	171.62
Average price per sqm Austria	1,331	1,401	1,464	1,542	1,563	1,635	1,767	1,868	2,234	2,400
Average floor space	91.28	91.58	91.88	92.18	92.49	92.79	93.09	93.4	93.71	94.01
Dwelling price	121,469	128,282	134,486	142,178	144,523	151,671	164,506	174,467	209,375	225,628
Dwelling price change	-	5.61%	4.84%	5.72%	1.65%	4.95%	8.46%	6.06%	20.01%	7.76%
Dwelling price index	100	106	111	117	119	125	135	144	172	186

Source: Austrian National Bank, Deloitte (2014), Author's calculation

5.5. X_A and Y_A : The life cycle of the real estate purchase

X_A : In the model the down payment to acquire the asset (and take out the mortgage) is assumed as an inverse function to the actual leverage of the asset or LTV, calculated based on the DSCR, or simply said functions as a plug to bridge the delta between the purchase price per dwelling and the maximum loan amount allowed under Factor 3, the financing parameters, with the limiting values of Factor 1, the household revenue, and Factor 2, the household OPEX. Further the down payment is then expressed into years by comparing the respective vintage year's net household income and the calculated down payment.

Y_A : Payback time is equal to the input parameter x_7 , assumed to be 25 years.

5.6. Z_A : Household Affordability Index A

The household Affordability Index A is calculated by adding the values under X_A and Y_A for each vintage year, rebasing the values to 100 in 2004 producing an index. A calculation summary for X_A , Y_A and Z_A can be found in Table 6.

Table 6. House Affordability Index – A

Trait	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Dwelling price	121,469	128,282	134,486	142,178	144,523	151,671	164,506	174,467	209,375	225,628

<i>Debt</i>										
Maximum Loan Amount	91,825	95,372	82,675	72,702	67,433	102,211	104,824	95,274	101,612	107,280
LTV	0.76x	0.74x	0.61x	0.51x	0.47x	0.67x	0.64x	0.55x	0.49x	0.48x
<i>Equity</i>										
Down payment	29,645	32,910	51,811	69,476	77,090	49,460	59,682	79,193	107,763	118,348
<i>Household CFADS</i>										
Household CFADS	6,876	7,185	6,969	6,772	6,562	7,196	7,096	6,930	6,748	6,622
<i>Saving years for down payment</i>										
Saving years for down payment	4	5	7	10	12	7	8	11	16	18
Loan term	25	25	25	25	25	25	25	25	25	25
Total life-cycle	29	30	32	35	37	32	33	36	41	43
<i>Change in life-cycle</i>										
Change in life-cycle	-	0.92%	9.65%	8.71%	4.22%	-13.26%	4.82%	9.03%	12.47%	4.64%
<i>House Affordability Index - A</i>										
House Affordability Index - A	100	101	111	120	125	109	114	124	140	146

Source: Author's calculation

5.7. X_B: The life cycle of the real estate purchase

X_B: Since under X_B no financing is assumed, the equity down payment equals to the purchase price and is divided by the Household's CFADS.

5.8. Z_B: Household Affordability Index B

The household Affordability Index B is calculated by rebasing the values calculated under X_B to 100 in 2004 producing an index, in analogy to Z_A. A calculation summary for X_B, and Z_B can be found in Table 7.

Table 7. House Affordability Index – B

Trait	Year									
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Dwelling price	121,469	128,282	134,486	142,178	144,523	151,671	164,506	174,467	209,375	225,628
<i>Equity</i>										
Down payment	121,469	128,282	134,486	142,178	144,523	151,671	164,506	174,467	209,375	225,628
<i>Household CFADS</i>										
Household CFADS	6,876	7,185	6,969	6,772	6,562	7,196	7,096	6,930	6,748	6,622
<i>Saving years for down payment</i>										
Saving years for down payment	18	18	19	21	22	21	23	25	31	34
Total life-cycle	18	18	19	21	22	21	23	25	31	34
<i>Change in life-cycle</i>										
Change in life-cycle	-	1.07%	8.09%	8.79%	4.90%	-4.29%	9.98%	8.60%	23.25%	9.81%
<i>House Affordability Index - B</i>										
House Affordability Index - B	100	101	109	119	125	119	131	143	176	193

Source: Author's calculation

5.9. Z_B: Coefficient β to Determine the Impact of Financing to Offset House Purchase Affordability

Finally the Coefficient β is calculate to determine the ability to offset the increase in housing prices by the use of financing by comparing the values in HAI-A and HAI-B in the last vintage year. To arrive at β the value of the HAI-A and -B respectively in the last year of review, 2013, has been reduced by 100, the ideal line of the HAI, indicating that the affordability remains stable in comparison to the initial year, and compared to each other in order to calculate the relative impact of financing on the affordability. An overview can be found in Table 8.

Table 8. Coefficient β – HAI-A vs. HAI-B vs. Dwelling price index

Trait	Year									
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
House Affordability Index - A	100	101	111	120	125	109	114	124	140	146
House Affordability Index - B	100	101	109	119	125	119	131	143	176	193
Dwelling price index	100	106	111	117	119	125	135	144	172	186
Offset Coefficient HAI A&B	49.82%									

Source: Author's calculation

6. Discussion, Limitation and Conclusion

While the prices for dwellings in Austria increased by 86% according to the model's output, the author finds the non-financed house affordability be even further deteriorated by 93%, which arguably is due to the significant decrease of post-tax wages in Austria during this time period. The simulated financing impact during this period was only able to offset the increase in housing prices by less than 50%, the hypothesis taken at the beginning of the research, that the decrease in base interest rates was insufficient to offset the simultaneous increase in real estate prices at post-tax falling household income, is therefore confirmed.

Limitations in the research could be found around the financing assumption, more concretely the margin above base interest rate and the fixing of the Debt Service Cover Ratio. Further the impact of different actual disposable income for housing purposes, rather than the fixed rate applied in the research, would have significant impact on the affordability indices calculated. Nevertheless the author believes that a base tendency can be observed and concluded even from the data and input short comings. Going forward additional research along the same lines should be conducted for other markets to evaluate if this is a local or more global phenomenon, potentially pointing into the direction of other and/ or additional asset inflation drivers.

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A Conceptual Mapping Resource Advantage Theory, Competitive Advantage Theory, and Transient Competitive Advantage

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Competitive advantage is the main purposed of the business entity focusing on market base view. Resource advantage theorists put their concern to empowering resources development with resources based view, in the other side needs to redefining competitive advantage. All the competitive advantage are transient, concluded the end of competitive advantage. Redefining competitive advantage by selling migration and shrewdness outward. This research to emphasize innovation capability rarely appears in the future.

Keywords: R-A Theory, C-A Theory, and Transient Competitive Advantage

JEL Classification: M21

1. Introduction

Recent marketing literature has already been vastly developing. Such phenomenon has developed the marketing literature into a dynamic science, even beyond its era. To this date, there have been at least twelve schools of marketing according to Shaw and Jones (2005). It is predicted that further development shall continue in the near future.

The development of marketing theories has been correlated to interaction among other disciplines (Jaw and Lee, 2007). Such interaction has created marketing to be a robust subject matter in which varied topics are developed and examined. In customer behavior subject, marketing science interacts with psychology, in resource-based advantage it interacts with engineering, and so on.

In examining business problems related to which strategy should be applied in winning the competition game has become an interesting debate over time. There are some advantage theories that have been elaborated by marketing pioneers, including resource advantage theory by Shelby D. Hunt, competitive advantage theory by Michael E. Porter, and Transient Competitive Advantage theory by Rita Gunther McGrath. These three theories contribute with insights to different viewpoints of advantage, so that in-depth analyses are necessary in order to create comprehensive literature reviews related to business activities.

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Article History:

Received 22 August 2015 | Accepted 7 September 2015 | Available Online 10 September 2015

Cite Reference:

Peranginangin, J., 2015. A Conceptual Mapping Resource Advantage Theory, Competitive Advantage Theory, and Transient Competitive Advantage. *Expert Journal of Business and Management*, 3(2), pp.140-149

2. Literature Review

2.1. Resource Advantage Theory

Resource advantage theory is an evolution of two basic theories by which it is developed. First, a theory proposed by Conner (1991) that organizations are expected to be able to explain factors that constrain them as well as reasons for their existence. This viewpoint is based on resource-based theory that focuses on heterogeneous demands and moving resources. Second, a competitiveness theory for differential advantage from Alderson (1957) and Alderson (1965).

Shelby D. Hunt and Madhavaram's 2006 and 2012 studies propose that resource advantage is capable of explaining important strategies in organizations, including resource-based strategy, competency-based strategy, industrial-based strategy, market-oriented strategy, brand equity strategy, market segmentation strategy, and relational marketing strategy.

The resources referred to resource advantage are those available, either tangible or intangible, which, in turn, are produced effectively and efficiently to be offered to particular market segments (Hunt and Madhavaram, 2012).

Resource advantage theory is built on mistakes in focus on organizational strategies in the pursuit of organizational advantage. Traditionally, the organizations have tended to focus on industrial competition. It is only after research from Hunt and Morgan (1999) and Hunt (2011) that organizational leaderships have started to focus on distinct product and service development strategy, which the competitors are unable to imitate. The ability to create these three conditions will result in advantage and improvement of organizational performance (Ferdinand, Widiyanto, and Sugiarto, 2012).

The resource advantage theory is built upon several thoughts as follows:

- a. Heterogeneous demands in single industry, between industries with dynamic characteristics.
- b. Information received by the customers is incomplete and expensive.
- c. Human motivation in fulfilling their needs.
- d. Organizational goals are to expect maximum advantages.
- e. Information held by the organizations is incomplete and expensive.
- f. Resources held by the organization consist of financial, physical, legal, human, organization, information, and relation.
- g. Resources are heterogeneous and are in unstable movement.
- h. Managerial roles in acknowledging, comprehending, creating, selecting, implementing, and restructuring current strategies.
- i. Dynamic competition needs innovation from within organization.

Structure and foundation of resource advantage lie within ability of the organization to innovate and differentiate by means of available resources. Differentiation and innovation are implemented to accomplish the optimal advantage, in which organizational advantage shall enhance it to learn to maintain its advantage and to improve its product value.

Structure and foundation of resource advantage can be explained by the following figure:

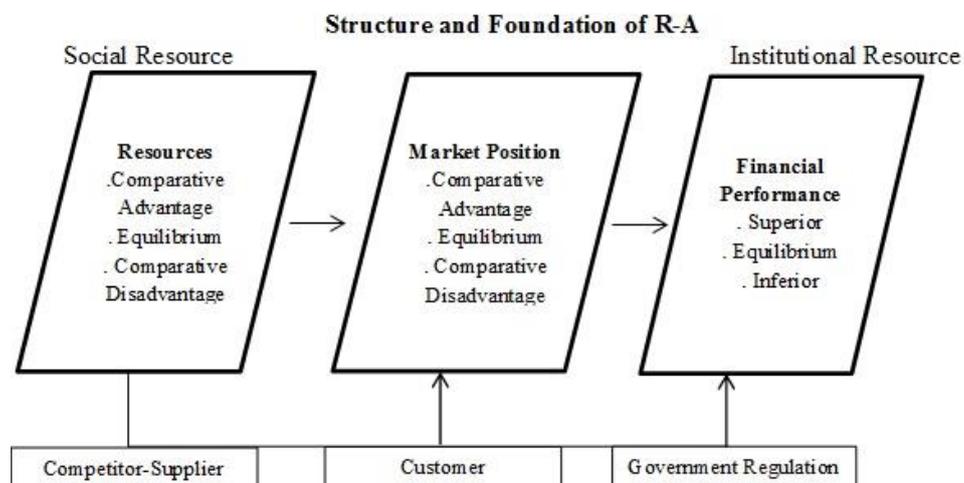


Figure 1. Resource Advantage Theory Competition Scheme

Source: Hunt (2011)

The above scheme explains that competition contradicts equilibrium, a sustainable learning and it makes optimal efforts in order to accomplish the advantage. The advantage will give a better position and higher market place to the organization in the competition

Resource advantage is an evolution of the absence of equilibrium during the competitive process, in which organizational innovation and learning stem from its internal resources. Both organization and customers have incomplete information, in which entrepreneurship, agencies, and government policies will affect the economic performance.

Following the resource advantage, competitive position can be elaborated as presented in the following figure:

1A Indeterminant position	2A Competitive advantage	3A Competitive advantage
4A Competitive disadvantage	5A Equilibrium	6A Competitive Advantage
7A Competitive disadvantage	8A Competitive disadvantage	9A Indeterminant position
Low	Moderate	Superior
SD Relative-Product Value		

Figure 2. Competitive Position Matrix
Source: Hunt (2011)

Market position in the competitive is in box 3A, for example, in the segment A the organization output, relative to the competitors, resources to be created and to be offered to the customers will fulfil superior criteria for the segment or have a lower price from the competitors. Each competition in the above matrix has different market segments.

Resource advantage theory emphasizes the importance of building values through resources, which organization internally possesses. It will differ from neoclassical theory, which posits that internal resources are within three dimensions: land/soil, employment, and capital. The resource advantage theory explains the internal resources more broadly, i.e. financial, legal, legality, human, organization, and relation. The following table summarizes the difference in concept of resources between neoclassical and resource advantage theories:

Table 1. The Difference Between Neoclassical and Resource Advantage Theories

Resources	
Neoclassical Theory	Resource Advantage Theory
Land	Financial (SD Cash, access to financial market)
Employment	Physical (plant, equipment)
Capital	Legal (brand, license)
	Human (expertise and knowledge)
	Organizational (competency, monitoring, policy, culture)
	Information (customers' knowledge and competitive intelligence)
	Relational (relation with suppliers and users)

Barney (1991) contends that an organization will be able to maintain its advantage if the organization is capable of giving added-value to the customers and if the competitors is unable to duplicate

the strategy. The competitive advantage of the organization does not depend on how long it maintains the advantage, but on the extent to which the organization does not duplicate the other organizations.

According to Zemanek and Pride (1996), an organization has strengths to direct its customers, such as price, quantity, product line, advertising and promotion, service, stock availability, credit to the customers, and display. The organization is expected to make the optimal use of its resources in order to maintain the advantage.

Hunt (2010) establishes that in resource advantage theory the characteristics of the products are highly heterogeneous, the information is incomplete, and the available resources are also heterogeneous. Therefore, innovation is necessary to help the organization obtain a better growth, sales, and profit. In addition, the growth may be obtained by efficiency and effectiveness of the innovation. Organizational growth occurs in the form innovation:

- a. Improving attribute value given by the customers through value-added use.
- b. Improving value given to the customers through adding value on resource quality and quantity.
- c. Decreasing costs by improving added-value on quality and quantity.
- d. Decreasing costs by making better use.
- e. Identifying new opportunities to improve growth.
- f. Identifying new opportunities for the newly built markets
- g. Identifying opportunities to establish new organization and to build resources in the new market.
- h. Improving quantity the organization offers through adding value of the quality and quantity the resources offer.

All these nine innovations will improve performance of the organization in the following forms:

- a. Outputs obtained are derived from the pursuit of financial performance.
- b. Production output growth proves the existence of the organization.
- c. Production output growth is capable of creating new organization.

Gupta (2013), in his research, contends that in order to accomplish business success and advantage an organization must possess good ability in innovating things that are difficult to be duplicated by prospective competitors in the future. Wang, Wang, and Liang (2014) explains that successful organizations have advantages to share knowledge and to possess strong intellectual capital. The advantage an organization possesses must be improve over time in form of such unique, difficult innovations that the competitors cannot duplicate.

2.2. Competitive Advantage Theory

Porter (1980) states that to perform the correct strategy, an organization must account for testing the following consistencies:

- a. Internal consistence. The organization must set rational and affordable targets. It also must have policies that support the target accomplishment, those which empower the overall lines of the organization.
- b. Environmental adaptability. Targets and policies to be set must be able to create opportunities and to adapt with resources relative to competitive challenge. The organization must react timely to the current environment and to respond to external interests.
- c. Resource adjustment. Resource availability must be equal to the competitors' advantage and the strategy implementation must be timely to allow the organization to create change.
- d. Communication and implementation. Objectives and targets of the organization must be truly comprehensible by the whole members. There must be a common agreement between the targets and the policy relative to the strategy implementation. The managers should be able to perform the strategy efficiently and effectively.

Porter (1990) and R.G McGrath, Tsai, Venkataraman, and MacMillan (1996), propose that organization is able to accomplish competitive advantage by innovation. The organizational innovation can be performed by vary methods and technologies. It will give advantages to the organization in many aspects.

Updated strategies and instruments towards multidimensional, either in product, marketing, or organizational design are necessary. Advantages can be obtained by market exploitation, threats neutralization, and cost efficiency (Sigalas et al., 2013).

Innovation performed by the organization must exceed the needs of a single segment because currently the competition is extremely global and transnational. Innovation must fulfil the preference and the needs of the international society. For example, the need for automobile of Indonesian customers is different from that of the American customers. Therefore, the organization innovators must be able to bridge or to mediate this difference in order for the products to fulfil the global needs. Ma (1999) said that a firm

integrates both proactive efforts in enhancing a firm's chances for the three generic sources of advantage, ownership, access, proficiency and preemptive efforts in reducing the rivals' chances.

Creating competitive advantage in an organization needs role and support from the government to help create conducive atmosphere, market creation, and massive raw materials provision for the organizational operation survival. Factors that determine the competitive advantage can be found in the following figure:

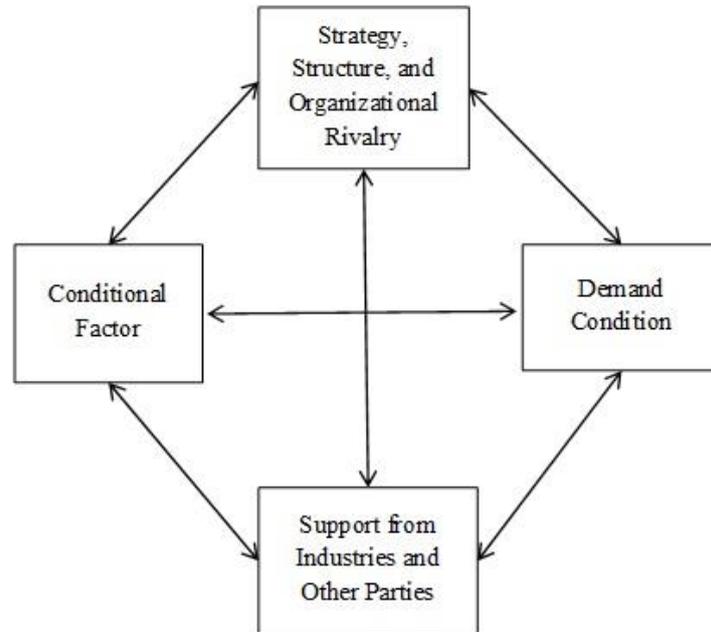


Figure 3. *Determining Factors of Competitive Advantage*
Source: Porter (1990)

The conditional factor is a government role in helping provide infrastructures, experts, and other supports to create competitive advantage. Whereas strategy, structure, and support from the organization is to create, to organize, and to manage. Demand condition is the government ability to create a domestic market as market base for goods and services. Support from industries and other interest parties refers to government involvement in supporting the organization to respond to international competition.

Pitts and Lei (1996) and Gunday et al. (2011) appreciate that creating competitive advantage demands organization attractiveness. Attractiveness can be derived from available resources and macro environment. Internal and external environments are intervening factors that affect the competitive advantage. Five intervening factors need to be taken into account to build an industrial attractiveness: potentially new competitors, customers bargaining power, suppliers bargaining power, intensity of organizational rivalry within industry, potential substitution goods and services (Sarpong and Tandoh, 2015).



Figure 4. *Intervening Factors of Attractiveness*

The basis of the competitive advantage lies within the ability to align the organization ability with its environment where the competition takes place. Therefore, the organization must be able to find new opportunities, answer challenges, overcome weaknesses, maintain advantages and create new strengths in the new competition arena.

J. B. Barney and Clark (2007) posit that an organization will take the advantage if it can create added value to its human, physical, and organizational resources. The added value must involve three unique characteristics, which are difficult to duplicate and substituted. Once these characteristics become more apparent, the competitive advantage will prevail, which, in turn, helps the organization to maintain the advantage Gebauer, Gustafsson, and Witell (2011).

Ferdinand (2013), explains that in creating competitive advantage an organization must possess specific advantages. These specific advantages are obtained by resource management and organization. They refer to the ability of the organization to manage and to possess cost leadership and differentiation advantage.

2.3. The Transient of Competitive Advantage

The end of competitive advantage is still limited to leadership conceptual framework that the objective of any strategy is to maintain the advantage. Such conceptual framework is deemed sacred by most organizations. Indeed, it may not apply over time due to environmental change and uncertainty.

Ritha Gunther McGrath (2013) writes that organization that suffers from competitive loss still applies old-fashioned assumptions of the theory of competition. The organization must have new formulae to respond to the change in competition strategy, innovation, and organizational reform, which has been immediately taking place. Such condition may put the organization in trouble if it does not have new formulae to answer the competition.

For some organizations, the competitive advantage is deemed irrelevant to apply because of the change in technology (McGrath, 2013). The advance of the technology has caused competitive advantage to rise, but quickly to disappear. Furthermore, digitalization allows much easier duplications, globalization causes fierce competition in the global arena.

An organization gets involved in competition not only within its industrial environment but also in arena-specific strategies. The comparison of the competition based on industry to that of based on arena can be explained as follow:

Table 2. Extent of Competition: Industry versus Arena

Description	Industry	Arena
Objective	Positional advantage	Area domination
Success Parameter	Market segment	Areal opportunity potential
Customer Segment	Demography and geography	Behavior
Major Trigger	Price, function, and quality comparison	Providing total customer experience
Behavioral Skills	Intra-industry or diversification	New expertise beyond industrial constraint
Term	Chess	

Source: McGrath (2013)

Current advantage is temporary. Therefore, the organization must simultaneously align between stability and agility in answering the competition. The organization must always create change combined with dynamism in line with the ongoing condition. The temporary advantage gives similar pressure at any aspect of the competitive life-cycle. The temporary advantage enables individual talent to grow as his or her ability does, building stable perspectives and heterogeneity of implementation.

Johannessen and Olsen (2009) conclude that in maintaining the advantage an organization must do a process of knowledge development by a systemic innovation. The government must possess dynamic and innovative abilities (Agha et al., 2012).

The temporary advantage strategy can be used for helping unhealthy business come out of difficulties. In anticipating the collapse, corporation must possess early warning about crises within it. This early warning is easier to be detected in marketing growth collapse. If the condition continues to be worsened, some efforts must be taken immediately in order to solve the problems, e.g., sales migration, corporate gain cut, discount endorsement, and acquisition of other corporations in order to limit the competition. Such strategy may help the corporation retain its advantage in the future.

Early warnings that the corporation must take into account for following potential crises are as follows:

- a. Employees are unwilling to buy products or services made by their own firms.
- b. Investment at the same level without expected gain.
- c. Customers get more affordable, easier, and better products than those made by other producers.
- d. Competition tends to sway to other direction than expected.
- e. Customers are no longer impressed by the offer.
- f. Leadership is losing trust from its employees.
- g. The team is losing the best personnel.
- h. Stock in possession is inadequate and of lacking quality.
- i. Scientists are predicting a change in business that the corporation gets involved due to change in technology.
- j. The corporation is no longer the priority target for job-seekers.
- k. Corporation suffers from slow growth rate.
- l. Lacking successful innovations in the past two years.
- m. Corporation decreases profit margin.
- n. Corporation provides risks to the employees.
- o. Management always declines and argues each bad news (by giving excuse, even in reasonable manners)

The early warnings mentioned above are capable of detecting potential crises within the corporation. As long as it has the right indicators the corporation may survive the bankruptcy.

The temporary advantage strategy uses resources to produce intelligence in doing a business process. Such intelligence is seen from the ability to rebuild and to alternate business processes into easier, quicker, and better outputs. This strategy is in contradiction to other advantage strategies, which use resources to obtain or to preserve them by exploitation.

Intelligence can be made available by some ways, including proactively not using any out-of-date assets in the competitive environment. The corporation must leave outdated technologies behind. Creating an integrated organization with information technology and corporation can create new business opportunities.

Below are examples of corporate assets, which must be responded immediately to preserve its business advantage:

Table 3. Change in Corporation Assets

1960			2010		
Computer Infrastructure	Big screen	Mini computer	AS/400	PC and Laptop	PDA Phone
Form of Computer	1 Corporation	1 Location	1 Deck	1Person	Available anywhere
Networks	Tape and Disc	Cable networks	Individual Corporation	LAN and Internet	WAN and Wireless
Computer Language	Factory and COBOL Languages	Factory and COBOL Languages	FORTTRAN,PL and Pascal	Visual Basic, Perl, Javascript	Web
Data	VSAM	Management Information System	Relational Database	WWW	Cloud
Telephone	Fow, telephone with switchboard	PBX	First generation hand-phone	Hand-phone development	VoIP, Corporate VM

Source: Accenture (2010)

The above table shows a migration of corporate assets in technology in order to get advantage provided by the blue column. If those in the red columns are still preserved, the corporation may lag behind the other competitors. Strong will and motivation are necessary to support innovations. The tendency of most corporates to exploit the assets contrast with the temporary advantage strategy.

The most important factor for the temporary advantage strategy is the ability to build innovative skills. Innovative perspective in the temporary advantage strategy is very different in that continued and systematical innovations become the prime priority. Likewise, from managerial and budgetary perspectives,

the innovation advantage complies with the ongoing business, whereas the temporary advantage strategy creates innovations by separate budgets. This strategic activity considers competitiveness to be a complement, whereas temporary advantage strategy deems it as dedication given over time.

There are six phases needed for building innovative skills:

1. Measuring current position and determining the most wanted growth.
2. Aligning all interests and available resources.
3. Creating process phase of innovation management.
4. Starting over system and socialization of the whole employees.
5. Beginning with something that is real.
6. Creating complement structures to do innovations.

In the temporary advantage strategy, creating innovations becomes the major key to creating the corporate competitiveness. Therefore, continued innovations must be obtained in the current global arena.

The temporary advantage strategy plays a significant role in creating advantage. The leadership must have his or her own perspective towards creating the advantage. He or she must hold assumption that innovations are created by pressures, always questioning *status quo*, involving other parties in the process, taking efforts immediately and precisely, enforcing new inventions, providing options, actively getting involved with externalities, and directing talents.

The temporary advantage will affect any individual within the team. Such strategy will change organizational system in favor of individual capacity, which, in turn, facilitates permanent career growth. Individual role is more dominant within the application of the temporary advantage strategy.

3. Discussion

3.1. The Comparison Between Resource Advantage, Competitive Advantage, and Transient Advantage Theories

Resource advantage theory focuses on the corporate internal resources, whereas competitive advantage theory focuses on the corporate external environment. In other words, the former theory is endogenous, whereas the latter theory is exogenous.

Meanwhile, temporary advantage theory focuses on resource value improvement in such a manner that competitors cannot imitate and distribute. The competitive advantage theory focuses on cost and differentiation. Below are points denoting the comparison of competition strategy between the theories O'keeffe, Mavondo, and Schroder (1996), as well as Hunt and Arnett (2003):

Table 4. Competitive Advantage vs. Resource Advantage

Explanation	Competitive Advantage	Resource Advantage
External analysis unit	Industry	Market segment
Market	Market as a whole	Market by segment
Main strategy	Alignment between industry and corporation	Organizational learning in building resources and capacities.
Management duties	Portfolio analysis and resource distribution	Resource creation and development
Advantage effects	Concentration on industry power over market	Giving superior value to customers
Deal Result I	Monopoly position	Great financial performance
Achievement	Surpass the barriers	Special skills due to resource ambiguity.

Source: O'Keeffe, Mavondo et al. (1996)

The above table (Table 4) shows that there are many principle differences between resource advantage and competitive advantage strategies. In applying each theory the corporation must be able to implement it. It is possible for the corporation to mingle both strategies should the conditions, i.e., externalities and internalities made it possible.

4. Conclusion and Recommendations

Fierce business competition has demanded corporations to be innovative. Products to be provided are expected to be so unique that competitors are unable to imitate or duplicate in order to gain competitive

value. Changes in perspectives are necessary. The most important effort relates to human development supported by dynamic resources.

Development of strategic assets must be in line with human resource development. The corporate executives must consider human resource as an intellectual capital. To win the competition, the corporation must be able to give birth to intelligence, sales migration, and strategic alliance with continued and systematic innovations.

Below are capacities the corporation must possess to be effectively exploiting its potentials:

1. Quick adaptation
2. multi-line differentiation
3. product and service innovation, and
4. Timeliness in taking any measure or action.

Consideration of the correct data and business intuition has been obtained.

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Remodeling Strategic Staff Safety and Security Risks Management in Nigerian Tertiary Institutions

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This paper examined safety and security risk management in tertiary institutions in Nigeria. The frequent attacks at workplace, especially schools, have placed safety and security in the front burner of discussion in both business and political circles. This therefore, forms the imperative for the conduct of this study. The work adopted a cross sectional survey research design and collected data from respondents who are security personnel of the University of Uyo. Analysis of data was done with simple percentage statistics while the research hypotheses were tested with mean and simple regression and correlation statistics. The findings of the study revealed that assassination, kidnappings and bombings were principal risk incidents threatening the safety and security of staff in University of Uyo. A significant positive relationship was found between the funding of security management and workers' performance. It was discovered specifically that employment screening, regular training of security personnel, regular safety and security meetings and strategic security policy formation were the main strategies for managing safety and security in University of Uyo. The paper concluded that safety and security management and control involves every worker (management and staff) of University of Uyo. It was recommended, among others, that management should be more committed to safety and security management in the University by means of making safety and security issues an integral part of University's strategic plan and also by adopting the management line model – one form of management structure where safety and security are located, with other general management responsibilities. This way, the resurgent cases of kidnapping, hired assassination, etc. would be reduced if not completely eradicated in the University.

Keywords: *staff safety, staff security, risk management, organizational performance*

JEL Classification: *M10, M14*

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Article History:

Received 15 August 2015 | Accepted 29 September 2015 | Available Online 18 October 2015

Cite Reference:

Akpan, S.S., Ayandele, I.A., 2015. Remodeling Strategic Staff Safety and Security Risks Management in Nigerian Tertiary Institutions. *Expert Journal of Business and Management*, 3(2), pp.150-165

1. Introduction

1.1. General Outlook

Cases of workplace safety and insecurity have assumed a global status and have posed great challenge to management of organisations. These developments are considered a rising omen in the workplace and are deemed to have defiled all conventional management strategies. Consequently there is a renewed awareness regarding safety and security which according to Belilos (2001) have taken precedence over all other subjects since the terrible tragedies of September 11, 2001, in New York, Washington D. C.; and Pennsylvania, which cost thousands of lives. While it is not realistic to believe that employees can be insulated from all potential threats to their safety or security, effective Human Resource Managers should take steps to help minimize these threats. From moral perspective, employers certainly have a responsibility to provide workers with a worksite that is as free from threatening conditions as it can reasonably be. From a legal perspective, the Occupational Safety and Health Acts of 1970 require that employers address safe and healthful working conditions. Specifically, the law requires employers to provide their employees with a place of employment that is free from recognizable hazards that are causing or are likely to cause death or serious physical harm to employees, as well as the exposure at which no worker will suffer diminished health, functional capacity, or life expectancy as a result of his or her work experience. The moral and legal taking on safety and security are pointers to how important a safe and secured work environment is to organizational growth and development.

According to Bertini (2000), good, safe and secured workplace bring a lot of improvements to organization in term of healthy and sustained operations that result in improved profit, organisational and operational efficiency, employee satisfaction with appertained effect of improved customer satisfaction all of which ultimately lead to organizational growth and development. In support of this opinion, Kiruja, Eirik and Sicko (2011) said good security management is about good program management: Proactively managing risks and being better positioned to deal with crises enables us to work safety and securely. This benefits our staff, beneficiaries, and other stakeholders. The inference here is that safety and security of personnel in an organisation are factor that can engender organizational growth. It follows that any organization that graves for growth and development should, in addition to managing other resources of the organization, also strive to ensure that employees work in a safe and secured environment. In recognition of the importance of safety and security Barabant (2001) has this to say:

“The security and safety of.....staff is of growing concern to managers of... organisations and their ‘stakeholders’. The fact that organisations increasingly find themselves working in violent environments, and particularly the perception that they are being targeted, has given rise to a range of internal measures, as well as inter-organisational initiatives; After an initial emphasis on security (acts of violence), staff safety (accidents and health) is attracting renewed attention.”

In view of the above, an employer therefore has more responsibility than hiring people to do their job. They must ensure that those hired, work in safe and secured environment otherwise the organization will not perform effectively. This is true because in Sheik’s (2000) opinion, as soon as employees feel that their superiors are disinterested in their work environment, they also lose passion for their work; when this happens, the entire workforce of a business collapse”. Therefore, Safety and security in every business should be taken seriously. It is not a gainsaying that unless management shows interest in the safety and security of employees, the latter group also ceases to pay attention to important details that may become crucial to the success of the organization.

There is great benefit for organizations to provide a safe and secured workplace for its workforce. According to Barabant (2001), there is indeed an incompressible element of risk in organisation’s work, but good security management is also a tool to help organization enter and remain in business irrespective of the risk involved, after all business is not devoid of risk. The loss of staff and assets, either through accident or incident, actually makes it more difficult for an organization to carry out its fundamental task. Organisations which are generally committed to safety and security management tend to have a culture of care for its staff, a commitment to competence and professionalism and a commitment to being a learning organization. The importance of the attitude of the director of the organization cannot be underestimated: “safety and security does not start with the type of staff member you recruit, it starts with the type of Chief Executive Officer you recruit’, (Barabant, 2001).

In view of the importance of having good safe and secured workplace there is need to find out how management of the university of Uyo has been handling the threat to workers safety and security on all the campuses of the university. In this study therefore, the researchers envisages a thorough discussion of

measures that management can adopt to ensure that safety and security of their staff at workplace are given paramount attention.

1.2. Statement of the Problem

Safety and security of personnel are today serious management challenges. Part of these challenges is due to apparent lack of definitive clarity between the concept of safety and security which has, often times, led to conceptual misunderstanding, misapplications and mismanagement. Acknowledging this conceptual confusion and its appertained devastative effect on organizations, Baratant (2001) explained thus:

“...yet there is confusion between security management, and safety management. Organisations are responsible for the safety and security of their staff. Both can be subsumed under the concept of ‘risk management’. But while there is significant overlap between measures to improve safety and measures to improve security, the two are not identical, and focusing on one at the expense of the other leaves dangerous omissions.”

As an allusion to the above excerpt, many organisations in their bit to tackling source of threats to safety and security at workplace and to the overall organizational performance, do often give much attention to one risk management dimension, for instance security alone, with less emphasis on safety or otherwise. The most common argument has been that safety and security risks are an integral part of organisation’s work; and that, organisations have been managing them for decades with existing tools and competences, so there is no need for additional or new measures (Baratant, 2001).

The above argument reveals dangerous and problematic assumptions that risk is static and cannot be reduced through any new measure. These assumptions go against the available evidence and realities, which is the fact that risk incidents are becoming more frequent (Barabant, 2001). Also, organisations are currently working in dangerous, volatile, risk-prone environments and the supposed ‘immunity’ of the organizational staff seem to decline.

Another problem is the often misused concept of safety to sometimes mean security in our daily activities such that these twin concepts are either not given proper attention or they are simply overlooked on account of the fact that their mentioning poses no serious threat or make no significant grievous sound in the organization. Whether management has taken bold steps to address these issues or not is a contentious issue. This contention is due to the fact that current hazards in Nigerian Universities are on the increase (Williams, 2012). It is becoming worrisome and most unfortunately so because staff safety and security appear to be left on the back burner until crisis occurs, at which time, people had fallen victim to crimes, get robbed, assaulted, and become sick or die (Barabant, 2001). This study therefore investigates how staff safety and security are managed in the University of Uyo with a view to suggest appropriate strategies to achieve a safe and secured workplace.

1.3. Objective of the Study

The main objectives of this research is to examine safety and security of personnel at workplace and how management or employers of labour have handled these issues strategically in the face of limited organizational resources. Specific objectives are to:

- i. find out if bombing, assault, corruption, kidnapping, organized crime, appliances/gadgets, machineries/equipment and, building are sources of safety and security threats to University of Uyo.
- ii. find out the opinion of security personnel concerning managements’ commitment to safety and security management in University of Uyo.
- iii. find out the relationship between safety, security management and staff performance in University of Uyo
- iv. find out if good management structure, command principle, meetings, funding, threat assessment, physical survey, employment screening, and operations planning are not effective strategies for effective staff safety and security management in the University of Uyo.

1.4. Hypotheses

To guide the conduct of this study, four research hypotheses were developed. The null form these hypotheses are as stated below:

- i. Bombing, assault, corruption, kidnapping, organized crime, appliances/ gadgets, machineries/ equipment and, building are not sources of safety and security threats to University of Uyo.
- ii. Management’s committed to safety and security management in University of Uyo is insignificant.
- iii. There is no significant relationship between safety and security management and staff performance in University of Uyo.

iv. Good management structure, command principles, meetings, funding, threat assessment, physical survey, employment, screening, and operations planning not effective strategies for effective staff safety and security management in the University of Uyo

2. Literature Review

The concepts of safety and security at workplace have received several attentions from both the academics and the industrialists. This is to say that these concepts are not only limited to organisations but also extends to the field of study and perhaps in a more debatable academic and industrial investigation. But it is regrettable that the concepts of safety and security have been misconstrued to be synonymous rather than inextricably related concepts that must be clearly distinguished and compared for proper understanding.

2.1. Safety and Security: Conceptual Distinctions and Issues

There are two slightly different meanings of safety and security. For example, home safety may indicate building's ability to protect against external harm events (such as weather, home invasion, etc.), or may indicate that its internal installations (such as appliance, stair, etc) are safe (not dangerous or harmful) for its inhabitants. Discussion of safety often includes mention of related terms. Security is such a term. With time, the distinction between these two have often become interchanged, equated, and frequently appear juxtaposed in the same sentence. Readers unfortunately are left to decide whether they comprise a redundancy. This confuses the uniqueness that should be reserved for each by itself. When seen as unique, as we intend here, each term will assume its rightful place in influencing and being influenced by the other.

According to Milan-Perez (2003):

“Safety is the condition of a “steady state” of an organization or place doing what is supposed to do. “What it is supposed to do” is defined in terms of public codes and standards, associated architectural and engineering designs, corporate vision and mission statements, and operational plans and personnel policies. For any organization, place, or function, large or small, safety is a normative concept. It complies with situation-specific definitions of what is expected and acceptable.”

Using this definition, protection from a home's external threats and protection from its internal structural and equipment failures are not two types of safety but rather two aspects of a home's steady state. In the world of everyday affairs, not all goes as planned. Some entity's steady state is challenged. This is where security science, which is of more recent date, enters. Drawing from the definition of safety, then: “security is the process or means, physical or human, of delaying, preventing, or protecting against external or internal defects, dangers, loss, criminals, and other individuals or actions that threaten, hinder or destroy an organisation's “steady state”, and deprive it of its intended purpose for being” (Milam-Perez, 2003). Using this generic definition of safety it is possible to specify the elements of a security program by looking at safety and security issues in organizations.

In human resource literatures, experts such as Van Brabant (2000, 1998), Davidson and Neal (1998), Jensen (1999) and Macnair (1995) among others, have highlighted security issues in organisations as encompassing areas such as security of the property itself, company assets, employees' and customers' personal belongings and valuables, life security, personal security, and job security (not covered here because this latter relates to income security), among others. Similarly, safety issues in organization relate to the structure itself, installations and fixtures (electrical, plumbing, air-conditioning and other installations), public and work areas (e.g. slippery floors, hazardous obstacles in traffic areas), safety of furniture, equipment, appliances, and utensils as well as health safety (nontoxic cleaning material and detergents used) and good quality air (what we breathe, dependent upon the type of equipment, installations and fixtures used, and regular repairs and maintenance).

Inferentially, the centre piece of safety issues in an organization is workplace accident and diseases which is more of internal and external risk exposures while that of security is workplace violence which is more of external than internal risk exposures. Implicitly therefore, there would not be a case of security without the mentioning of safety in an organizational setting. This is because these two concepts are so interwoven such that distinguishing and treating them separately become difficult and inappropriate within an organization's risk management framework. The most important point to note in the discussion of security and safety issues in an organization is that, both concept fall within the framework of risk apprehension and management.

The external risk exposures asserted to be appertained to security issues in organizations is linked to Brabant's (2001) corporate security. This security concept has connotations of site protection, protection of confidential corporate information, VIP protection of executives (for example against kidnapping or

blackmail), and protecting the organization from liability through insurance and legal clauses. It would be wrong to believe that no senior executive or board member of an organization, even some members of the public could possibly understand security in this way. The internal risk exposure asserted to be linked to safety issues in an organization is also supported by Brabant's (2001) purely defensive security concept: Security here has connotations of protective procedures (no-go area, curfew times, convoy driving, checking-in of visitors to the premises...) and protective devices (helmets, flak jackets, barbed wire, radios). According to Van Brabant (2000), this is a fairly widespread concept.

However, in this study, discussions on each of safety and security are without recourse to their etymological enquiry although this may be considered artificial and conjectural. It is no doubt that a conceptual distinction can be made between 'safety' and 'security', whereby the former refers to accidents and diseases, while the latter refers to acts of violence. There are two schools of thought: those agencies that quite explicitly make the conceptual distinction, and those that equally explicitly do not want to do so.

In the over-arching concept of risk management, safety and security cannot be used synonymously otherwise it becomes a way of signalling that safety cannot be overlooked and exclusive attention paid to security. Thus, in this study, both safety and security are considered together as inextricable concepts that must be addressed together in order to tackle and manage risk exposures at workplace.

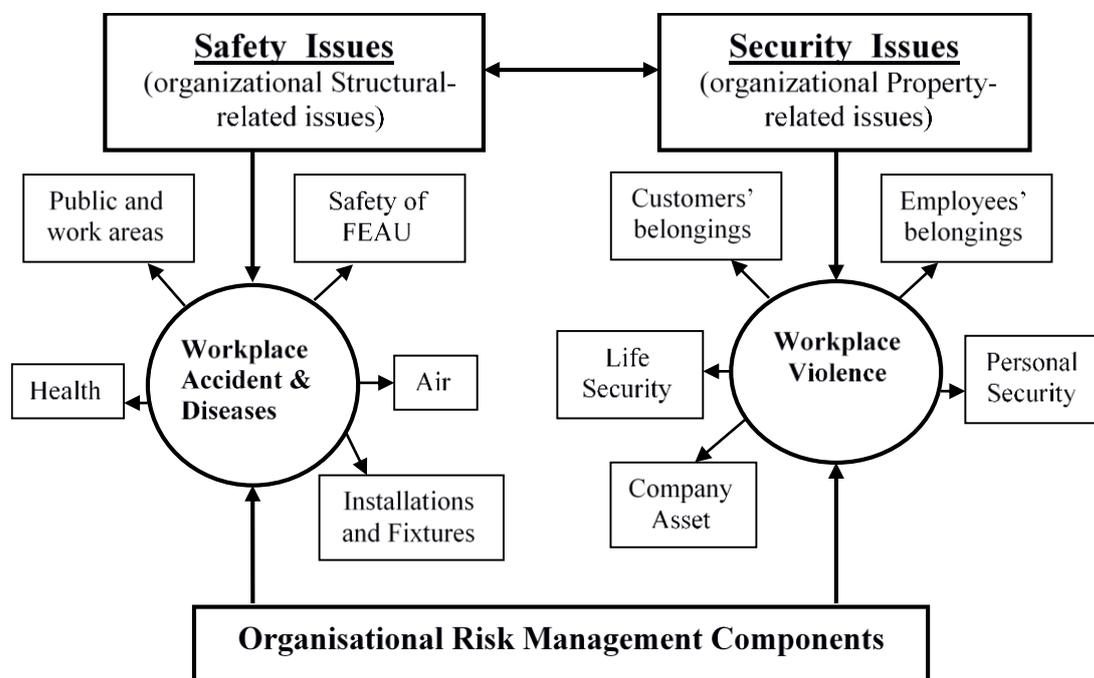


Figure 1. Safety and Security issues in organization

Source: Researchers' inference from the above discussions

2.1.1. Sources of safety and security threats in organizations: Global Review

An analysis of incidents worldwide suggests that the primary safety and security threats arise from a number of sources. To ensure that staff safety and security is ensued in an organization, the various causes or sources of these threats must be identified and appraised. Safety and security of personnel at workplace is caused by a number of factors. Accordingly, Anderson (2010) has developed an extensive database to help identify risks, assess probability of threats and assist in mitigating the potential for disasters. The database-which now encompasses 80 countries, identified the various sources of safety and security threats discussed below:

i. Bombings: The incidents of bombings are most prevalent in all regions. Anderson (2010) reported that in Africa, for example, there were 182 bombings or attempted bombings between 1990 and 1998, while Asia reporting showed a count of 358; Latin America at 344 and the Middle East at 119. Bombings typically result in extensive property damage, high incident of injury and lengthy disruption of operations, not only to the target company, but to adjoining businesses extended blocks or miles from the bombing target. According to Anderson (2010), Colombia, Panama and Peru, Uganda, Greece, Sri Lanka all experienced one form of bombing or the other while In Nigeria, the incident of bombing has been on the increase with the persistent activities of Boko Haran sects in the Northern parts of the country.

ii. Assaults: Assault is the second most frequent offenses reported after bombings. Assaults take the form of shootings, murder and physical assaults on a person. Various police jurisdictions report high numbers. According to Sao Paulo, Brazil police records, for example 4,778 people were murdered in Sao Paulo in 1997, averaging 13 homicides per day. The Brazilian Ministry of Justice reported that 31 of every 100,000 Brazilians are murdered compared to 20 per 100,000 in Mexico and 10 per 100,000 in the United States. The records of the Colombian National Police reflected 31,808 murders or 87 per day in 1997, as well as 204 muggings or assaults committed in Colombia every 24 hours. Mexico City reports more than 250,000 crimes annually or approximately 700 per day. In Nigeria, incident of assaults are also increasing especially on females at workplace. Most common among all assaults is sexually harassment.

iii. Kidnapping: This threat has emerged as a problem worldwide, reaching critical level in Colombia and Mexico. Kidnappings are conducted by terrorists, criminals and others acting for political reasons. Most of the kidnappings are motivated by economic reasons, but in some cases are undertaken to effect political change in a country. Most are resolved peacefully, but some have tragic results. These threats are become almost a legalized business in Nigeria and especially in Akwa Ibom State. Most of these threats in Nigeria and Akwa Ibom State are political reasons. These have however, cause serious safety and security issues in many organizations in Nigeria and Akwa Ibom State.

iv. Organized Crime: The threat from organized crime elements has reached global proportions. The threat ranges from the well-developed economies of the United States to such places as Hungary, Russia, India, South Africa and other emerging markets. Organized crime groups, sometimes working in concert with distant organization, are generally engaged in transporting stolen goods internationally, extortion, murder, bombings, drug trafficking, arson and bribery of government officials. In Hungary, organized crime has been responsible for killing a diplomat, newspaper publisher, the bombing of several political candidates' houses and offices, as well as more than 100 other bombings since 1991.

v. Corruption: The International Monetary Fund, World Bank and Inter-American Development Bank are all addressing the issue as it relates to projects with which they are involved. The U.S. Commerce Department estimates that companies worldwide operating outside their own national borders paid approximately \$80 billion in illegal payments or bribes to officials in other countries since 1995.

2.1.2 Safety and Security Management Framework and Strategies

The management of safety and security of personnel at workplace revolve around many factors as encapsulated in figure 2, adapted from Brabant (2001).

The framework presented below (figure 2) contains several complex activities that are involve in effective safety and security risk management, the cardinal activities are captured in what Brabant (1998) refers some years ago as the 'safety-security triangle', which represent three ideal types of safety and security risk management strategies namely: acceptance, protection and deterrent. In a nutshell, an acceptance strategy tries to reduce or remove the threats by increasing the acceptance for an organization's presence and work in a particular environment. Another way of putting this is 'winning the hearts and minds' of people. A protection strategy does not affect the threats but tries to reduce organization's vulnerability, through protective devices (high walls, barbed wire, flak jackets, blast-walls or – where there is respect, - a prominent logo). A deterrence strategy essentially tries to contain a threat by posing a counter-threat (arrest and fines, international sanctions, trial by an international tribunal and, ultimately, armed protected with the possibility of return fire).

As explained further by Brabant (2001), different safety and security risk management strategies require different staff skills and time allocation. For instance, a protection strategy requires mostly technical knowledge and is least context specific and requires political, social and anthropological understanding, and diplomatic and negotiation skills, as well as significant more time spent monitoring contextual developments.

This 'security triangle' (Figure 2) has been very successful, not so much because what it said as totally new, but because it gave simple concept and simple words to things that organizations has been implicitly practicing all over the world. It would be a mistake, however not to read the commentary with the triangle, and therefore to misuse it. Some organizations seem to have grasped on to 'acceptance' and declare it their strategy. This could be a dangerous mistake.

The commentary says that many individuals, organizations and even countries seem to have a preferred style, but that the art of safety and security management is choosing the right mix of strategies, in accordance with your threat and vulnerability analyses in a given context. Thus, an acceptance strategy is not going to prove very effective against brutal organized crime. The security triangle cannot be taken in

isolation, its place and use needs to be seen in the context of a comprehensive safety and security management framework as presented in Figure 2 below.

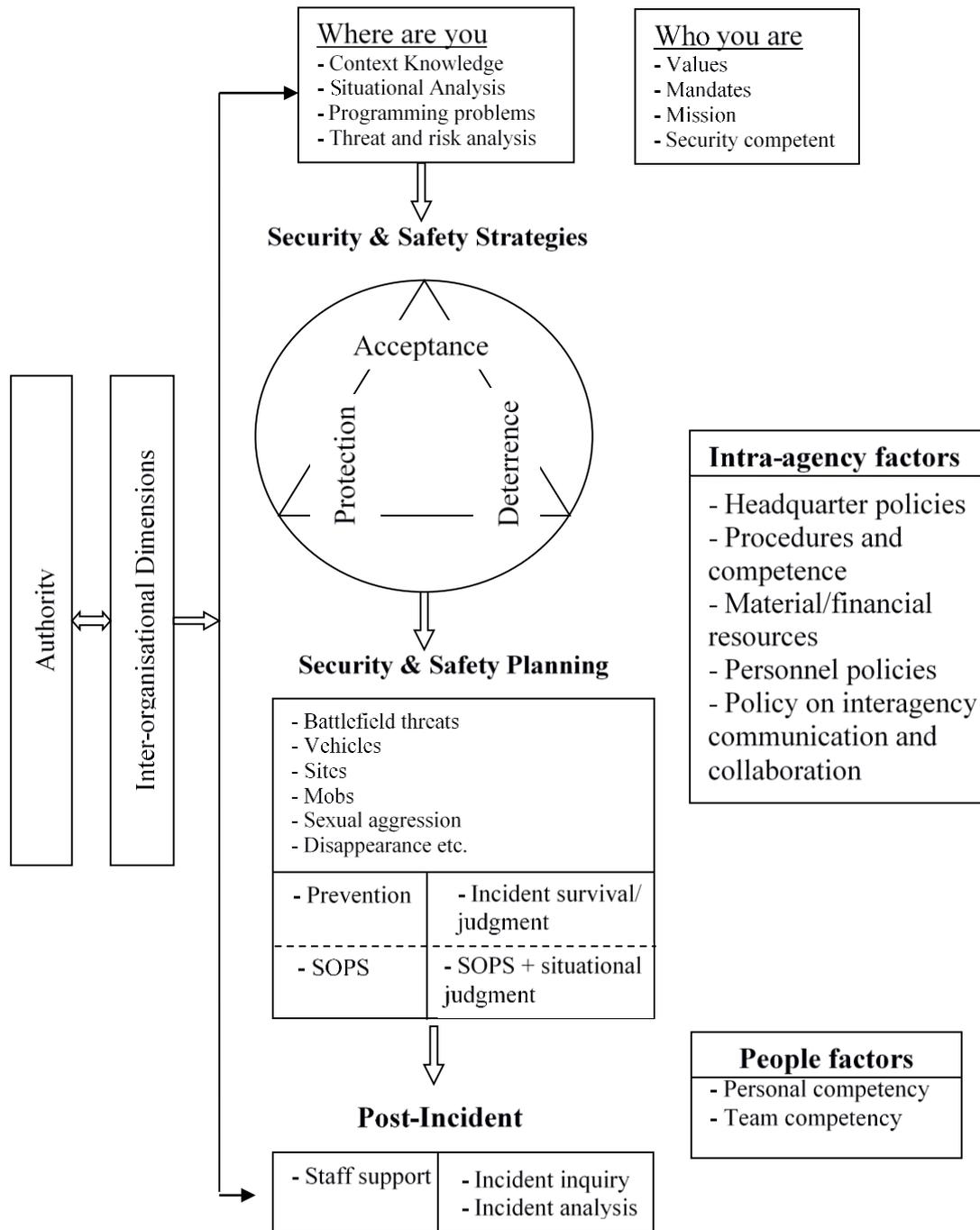


Figure 2. Safety and Security Risk Management Framework

Source: Adapted from Brabant (2001). Mainstreaming the Organizational Management of Safety and Security: A review of aid agency practices and a guide for management. HPG Report 9 March, 2001.

From the above framework (figure 2), it is evidenced that management of organizations can manage safety and security of personnel in a number of ways such as having good management structure, regular meetings, safety and security review, safety and security policy, proper funding, intra-firm threat assessment, physical security survey, pre-employment screening/training, special event planning, market insurance, self-insurance and self-protection (UNHCR, 1997; Davidson and Neal, 1998).

(i) **Good management structures:** Three types of managerial set-up for strengthening safety and security are in vogue. These include *the management line model*, where safety and security is located, with

other general management responsibilities within the operational line management between headquarters and the field; but the problem for line managers here is lack of time and, sometimes, of sufficient competence; *the specialist security officer model*, where one or more such post are created at headquarters and in the field, often outside of, and subordinate to, the line management; However, a frequent problem here is the lack of interest and/or competence among line managers, who can ignore or override the 'advice' of a security officer; and, *the security advisor model*, where the responsibility for security management lies within the management line, but there one or more security advisors at headquarters, who support the organization as a whole, and specific field offices.

(ii) **Creation of security focal point:** Several agencies have designated staff as their 'security focal point'. In practice, this can cover different roles: the specialist security officer or the security advisor can be fulltime, but also can be a senior line manager, who ensures that security remains on the agenda of top-level managers, and who, as time allows, direct organizational efforts to improve, safety and security management.

(iii) **Good chain-of-command principle:** Good safety and security management requires clarity about authority and responsibility, lines of communication and decision-making. Good practice holds that authority and responsibility are vested in line managers, and that safety and security are managed 'close to the ground'. However, decentralized organization risk losing overall consistency, and the checks and balances that headquarters provide.

(iv) **Holding regular meetings:** Making significant improvements in organizational safety and security management requires one or more for a at head-quarters where discussions can take place. Macnair (1995:21) once said "organizations that have achieved a strong safety and security culture can rely on regular meetings of their operations and senior management teams, creating ad hoc working groups as the need arises".

(v) **Safety and security review:** This can be conducted by staff, or by outsiders. It will, however, be effective only if top management follows up on its recommendations. An important precondition for improved security management is clarifying what security concept is appropriate. Not recommended are concepts of 'corporate security' with 'VIP protection', nor a narrow 'procedural-technical' concept that emphasizes protective procedures and devices. What is recommended is a multi-dimensional security concept, that brings into play the values and principles of the organization, its mandate and mission, contextual analysis and scenario monitoring, the organization's position in relation to the multitude of actors in a particular context, the nature and design of field-level programmes and the way the organization manages its staff, (Salama, 1999).

(vi) **Formation of safety and security policy:** Few agencies currently have a safety and security policy. It is possible to develop a policy relating specifically to security and another one to safety, or to integrate both. The value of such policy is that it makes safety and security management a corporate responsibility, rather than an operational issue. It then obliges management to act, and legitimizes the allocation of staff, time and other resources.

(vii) **Proper funding:** A key management question will always be that safety and security cost money. For many organisations, new expenditure requirements are now emerging. One is for increased site protection, due to a rise in crime. If safety and security is fully written into operational budgets, it will help a great deal in solving threats from these vices. Even then, some reserve funds probably have to be kept available centrally, to cover unexpected and non-budgeted requirements.

(viii) **Intra-Firm threat assessment:** Prior to physically launching operations, an analysis should be conducted of the organization and of the market within which the organization is located. In this process, current threats may be addressed in the immediate market era, as well as in the natal context. The risk assessment should encompass the identification of particular criminal problems and crime statistics, as well as the evaluation of local and regional law enforcement agencies. The agency review should in particular focus on an assessment of proficiency, training, degree of professionalism, and level of response to incidents.

(ix) **Physical security survey:** Once the intra-firm and market area assessments are complete, the next step is a physical security survey. If done thoroughly at the outset, it may reduce the frequency of need for future assessments. The common link here, however, is perimeter security and access control. Both of these issues should be addressed in the physical security survey. The survey should include the identification of vulnerabilities and critical operational components, such as communications, power supply and valuable storage and data processing areas.

(x) **Building design and security:** New construction should include a crime-prevention design audit. Design for crime prevention in organisations can be highly beneficial. TO be considered are such factors as

the relationship of buildings to parking areas and structures, lighting, perimeter views and protection, and security system.

(xi) **Pre-employment screening/training:** All employees in an organization should have a thorough background check conducted. There have been a number of instances in which firms have hired individuals with criminal records in illegal drugs sales or theft. Incidents of drugs dealing, time-clock tampering and theft are relatively common problems that can be greatly mitigated with thorough employment and criminal checks. This process is especially important when selecting security personnel.

(xii) **Training:** these programs should be developed to enhance safety and security among all staff in addition to the security force. Employee training should not only include a focus on organizational functions (client relations check-in procedures, daily operations, and administrative responsibilities), but security awareness as well. As is the case at most companies, safety and security staff is limited and is sometimes strained due to commitments and shrinking staff. By providing the entire employees with training in the identification of safety and security issues, a description of operational methods, where to report information and periodic updates on security advisories, management can in effect add additional “eyes” and to the organization.

(xiii) **Safety and security planning and operations:** It is important to broaden the focus of risk and systematize processes. Each firm, for example, should have a detailed bomb threat plan that covers procedures to include the reporting person, execution of the search plan, what to do if a suspect package is found and evacuation plans. The process is critical because time is always of the essence. Many bomb threats are made for the purpose of disrupting a company’s operations. Again, information must be properly handled due to the scope of potential damage.

(xiv) **Special events planning:** These events often involve government dignitaries, official and organizations senior management, associations that may be embroiled in controversial policies or business transactions that can elevate threat. In some cases, police or other government agencies provide security but this does not obviate organizational responsibility. The example of the bomb threat at the banking conference in Colombia, for example was augmented by exposure of detailed conference plans on the Internet. Organisations needs to track where information has been distributed, including the internet, to determine the level of risk that may result.

2.2. Relevant Theory and Empirical Review

This work is supported by Maslow’s Needs Theory. Maslow was a humanistic psychologist who proposed that within every person is a hierarchy of five needs, namely physical, safety, love, esteem and actualization. His theory is found within the domain of motivation which he said is a function of need not met. Thus if motivation is driven by the existence of unsatisfied needs, then it is worthwhile for a manager to understand which needs are the more important for individual employees. In this regard, Abraham Maslow developed a model in which basic, low-level needs such as physiological requirements and safety must be satisfied before higher-level needs such as self –fulfilment is pursued. In this hierarchical model, when a need is mostly satisfied it no longer motivates and the next higher need takes its place. The section of this theory that is relevant to this study is the second section which is need for safety and security. The bottom-line in this need theory and relevant section of it is that human beings must feel safe in their environments and free from any threat of attack by aggressors, they also need to live in a secure and certain environment in which they can act as social beings.

The first study to specifically examine the relationship between insecurity and safety was conducted by Probst and Brubaker (2001). In this study, the researchers found that when insecurity increased, employee safety knowledge and motivation to comply with safety policies and procedures decreased and organizational performance reduced proportionately. As a result, reported safety compliance as well as organizational performance was adversely affected. Not surprisingly, employees with insecure and unsafe work place suffered more accidents and injuries compared with employees with relatively more secured and safe workplace.

Although Probst and Brubaker’s (2001) findings were replicated in two cross-sectional analyses and one longitudinal analysis, questions remained regarding the direction of causality. Did insecurity cause poor safety outcomes, or did a poor safety record cause an employee to have less security? To address this issue, Probst (2002) conducted a laboratory experiment to manipulate organizational layoffs and observed their effects on employee security and safety behaviours. The results indicated that individuals threatened with layoffs violated more safety policies and produced lower quality output than their secure counterparts. This means that some sources of safety and security threats are also internal or within an organization. Although these results in conjunction with the earlier field study research clearly suggest that insecurity and unsafe

workplace causes more negative outcomes, other empirical research suggests just the opposite – that insecurity and unsafe workplace is related to more positive outcomes at work.

More recently, however, research is beginning to suggest that poor safety and insecurity may also have a detrimental effect on employee work attitudes, behaviour and outcome, (Grumberg, Moore, and Greenberg, 1996, Probst, 2002; Probst and Brubaker, 2001). In the United States alone, over 5,000 employees lost their lives in 2001 due to work related injuries, and an additional 5.7 million employees suffered nonfatal work-related injuries and illness (Bureau of Labour Statistics, 2001). Although there is research to suggest that employee job insecurity may be contributing to this workplace accident and injury numbers, other research suggests instead that job insecurity is related to more positive safety outcomes (Parker, Axtell, and Turner, 2001).

3. Methodology and Data Set

This research was an applied study aimed at solving the safety and security management problem in an organization. The study design adopted was a cross sectional survey design. By this design, the researchers was able to administer copies of questionnaire to a sample of 144 respondents drawn scientifically from a total population of 224 who were security personnel in the University of Uyo through the use of Taro Yamen’s formula as presented below: $n = N/1 + N(e)^2$; with $e = 5\%$; $n = 224/1 + 224(0.0025) = 144$. Out of the 144 copies of questionnaire administered, a total of 135 questionnaires representing 93.75% response rates were returned to the researchers in useable form. And this became the sample used for this study.

Statistically, mean and standard deviation was used in analysing responses from respondents and the mean (average) obtained is interpreted based on the interpretation scale (see Table 1). By the Likert Scale Rating, responses obtained from the respondents on questionnaire items were weighted in order to get their mean. Weighted scores refer to the respondent’s scores against each questionnaire item multiplied by the scores under each Likert Scale Point (LSP). The products were added together on each column in order to find out the average (mean) using the number of respondents involved. The Hypotheses were tested using Pearson Correlation Coefficient (R) Statistics with the use of SPSS. The Null hypotheses was accepted where R at $P > 0.05$ and rejected where R at $p < 0.05$. However, the decision rule for the mean statistics was that where the arithmetic mean (μ_a) value is the same with the Harmonic mean (μ_h) and Geometric mean (μ_g) value, the null hypothesis was rejected and the alternative hypothesis accepted, otherwise the reverse. Thus: Reject H_0 and accept H_i if $\mu_a = \mu_h = \mu_g$; Accept H_0 and reject H_i if $\mu_a \neq \mu_h \neq \mu_g$.

Table 1. Likert Point Rating and Interpretation Scale

Options	Symbol	Likert 5-point Rating Scale	Likert 5-point Interpretation Scale
Strongly Agree or Very committed	SA or VC	4	3.50-4.00
Agree or Committed	A or C	3	2.50-3.49
Disagree or Fairly committed	D or FC	2	1.50-2.49
Strongly Disagree or Not committed	SD or NC	1	1.00-1.44
Undecided	U	0	0.00-0.99

Source: Inference from Hassan and Olaniran, (2011).

4. Data Presentation, Analysis and Results

The analysis done here are to help proffer objective answers to the questions. It is thus, an objective analysis of the subjective responses obtained from the respondents in relation to the questions asked. The result on the various sources of safety and security threats to University of Uyo are presented in table 2. From the responses on table 2, it is evident that all, except two sources were not agreed by the respondents as constituting sources of safety and security threats. These sources were assaults and corruptions with the mean (μ) values of 2.30 and 2.23 respectively. All other sources were agreed with different degrees of agreements.

Table 2. Sources of Safety and Security Threats to University of Uyo

Sources of safety security threats	SA 4	A 3	D 2	SD 1	U 0	N	Total	Mean	Interpretation
Bombings	83 328	47 141	4 8	2 2	0 0	135 -	479	3.55	SA
Assaults	31 124	34 102	25 50	35 35	10 0	135 -	311	2.30	D
Corruption	29 116	32 96	28 56	33 33	13 0	135 -	301	2.23	D
Kidnappings	92 368	37 111	3 6	1 1	2 0	135 -	486	3.60	SA
Organized Crime	62 248	57 171	6 12	3 3	7 0	135 -	434	3.22	A
Appliances / gadgets	65 260	54 16	5 10	4 4	7 0	135 -	436	3.23	A
Machineries/ Equipment	60 240	60 180	2 4	3 3	10 0	135 -	427	3.16	A
Building	42 168	51 153	12 24	10 10	20 0	135 -	355	2.63	A

Source: Field survey data, 2013

These sources and their various means values are presented in figure 3 for a clearer assessment.

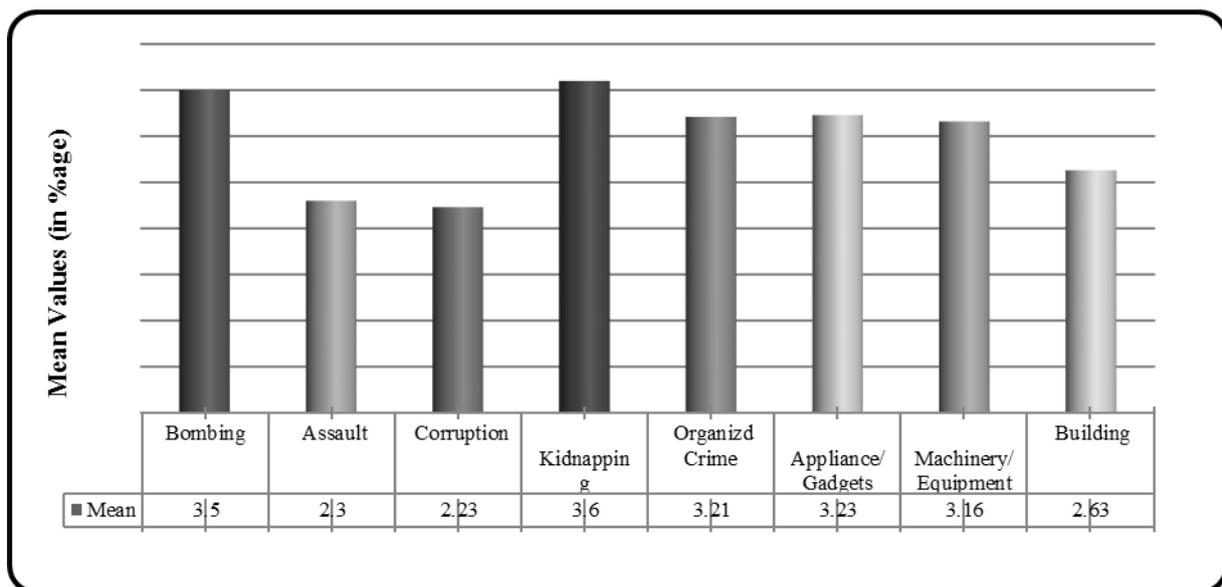


Figure 3. Pictorial presented of mean value on sources of safety and security risks in organization

Source: Constructed from Mean values on Table 2

The corresponding hypothesis that bombing, assault, corruption, kidnapping, organized crime, appliances/ gadget, machineries/equipment and, building are not sources of safety and security threats to University of Uyo was tested and the result is presented in Table 3 that follows.

Table 3. Mean Result for Sources of Safety and Security Threats

Likert point (2)	Bombing	Assault	Corruption	Kidnapping	Organized Crime	Appliances /Gadgets	Machineries /Equipment	Building
Mean	3.5500	2.3000	2.2300	3.6000	3.2100	3.2300	3.1600	2.6300
Harmonic Mean	3.5500	2.3000	2.2300	3.6000	3.2100	3.2300	3.1600	2.6300
Geometric Mean	3.5500	2.3000	2.2300	3.6000	3.2100	3.2300	3.1600	2.6300

Source: Generated from SPSS

The result on Table 3 shows that both Harmonic and Geometric mean which were used as an extended statistic to validate the mean value of 3.55, yielded same value with no variance and no error. Therefore, the null hypothesis was rejected while the alternative hypothesis was accepted. Thus, bombing, assault, corruption, kidnapping, organized crime, etc all constitute sources of safety and security threats to University of Uyo. On the extent of management’s commitment to safety and security management, responses are presented in Table 4 below.

Table 4. Extent of management’s commitment to safety and security Risk management

Level of Mgt. Commitment	VC 4	C 3	FC 2	ND 1	UD 0	N	Total	μ	Inter-pretation
Response	22 [16.30%] 88	41 [30.37%] 123	49 [36.30%] 118	11 [8.15%] 11	12 [8.89%] 0	135 [100%]	340	2.52	A

Source: Field survey data, 2013

From Table 4, the various levels of management commitment to safety and security management in the University of Uyo are identified. With the mean value of 2.52, and the highest response rate being 49 representing about 36.30%, it can be stated that management is fairly committed to safety and security management at the University. The pictorial representation of this finding is in figure 4.

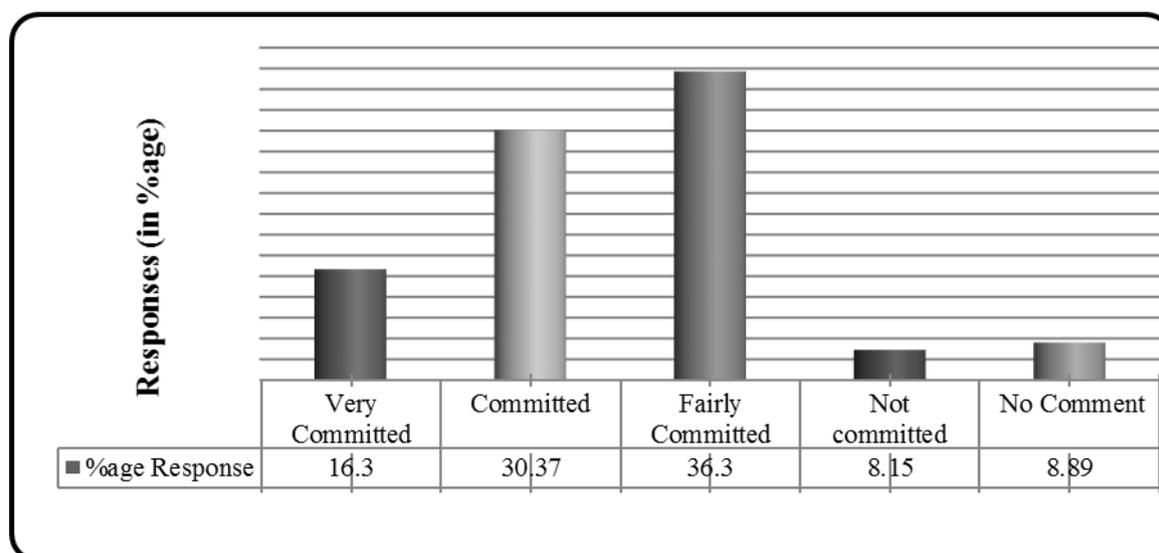


Figure 4. Pictorial Presentation means value on the level of managements’ commitment to safety and security management in organization.

Source: Constructed from Mean values on Table 4

The corresponding hypothesis that the level of management’s commitment to safety and security management in the University of Uyo is not significant was tested and the result presented on Table 5 shows that both Harmonic and Geometric mean values are the same. There was no variance and no error.

Table 5. Mean Result for Management Commitment to safety and Security

Likert point (2)	Mean	Harmonic Mean	Geometric Mean
Total	2.5200	2.5200	2.5200

Source: Generated from SPSS

By this result, the null hypothesis was rejected in favour of the alternative hypothesis. This means that the level of management’s commitment to safety and security management in the University of Uyo is significant. Responses to the relationship between safety and security management and staff performance in University of Uyo are presented on Table 6.

Table 6. Relationship between safety and security management and staff performance in University of Uyo

Level of Mgt. Commitment	VS 4	S 3	INS 2	NS 1	UD 0	N	Total	μ	Inter-pretation
Response	25 [18.52%] 100	51 [37.78%] 153	39 [28.89%] 78	13 [9.63%] 13	7 [5.19%] 0	135 [100%]	344	2.55	A

Source: Field survey data, 2013

With the mean value of 2.55, the respondents, on aggregate agreed that there is a relationship between management commitment to safety and security and staff performance in University of Uyo. Going by the principle of majority rule, the relationship is significant given the highest response rate of 37.78%. The result of the corresponding hypothesis which state that there is no significant relationship between safety and security management and staff performance in University of Uyo is presented in Table 7.

Table 7. Correlation Result for the relationship between management commitment to safety and security and Staff Performance in University of Uyo.

		Mgt commitment	Staff Performance
Mgt. commitment	Pearson Correlation	1	.644
	Sig. (2-tailed)	0	.241
	N	5	5
Staff Performance	Pearson Correlation	.644	1
	Sig. (2-tailed)	.241	
	N	5	5

Source: Generated from SPSS

The above result shows that the calculated r-value of .644 was greater than the critical r - value of .196 at 0.05 alpha level and n = 134. This implies that management commitment to safety and security contributes about 64.4% to staff performance in University of Uyo. Since this percentage contribution was in excess of 50.00% on average of 100%, the researchers therefore rejected the null hypothesis and accepted the alternative hypothesis. In other words, there is a significant relationship between management commitment to safety and security and staff performance in University of Uyo. Response to the most effective strategies for effective staff and security management are presented in Table 8.

Table 8. Most effective strategies for effective staff safety and security management

Safety & security management strategies	SA 4	A 3	D 2	SD 1	U 0	N	Total	μ	Inter-pretation
Good Mgt. Structure	37 148	52 156	24 48	14 14	8 0	135 -	- 366	2.71	A
Good chain of command principle	30 120	30 90	25 50	20 20	35 0	135 -	- 280	2.07	D
Regular safety & security meeting, policy information & review	79 316	45 135	6 12	3 3	2 0	135 -	- 466	3.45	SA
Proper funding	84 336	47 141	2 4	1 1	1 0	135 -	- 482	3.57	SA
Intra-firm threat assessment	56 224	63 189	7 14	5 5	4 0	135 -	- 432	3.20	A
Physical safety & security survey	50 200	63 189	9 18	6 6	7 0	135 -	- 413	3.06	A
Pre- & post-employment screening/training	78 312	47 141	5 10	4 4	1 0	135 -	- 467	3.46	A
Safety & Security Planning & Operation	56 224	62 186	10 20	5 5	2 0	135 -	- 435	3.22	A

Source: Field survey data, 2013

From the responses in the table, it is shown that all, except good chain of command principle strategy which had the least means (μ) value of 2.07 was not agreed by respondents as constituting an effective strategy for managing safety and security risk effectively. Figure 5 presents the findings on the most effective strategies in order of priority.

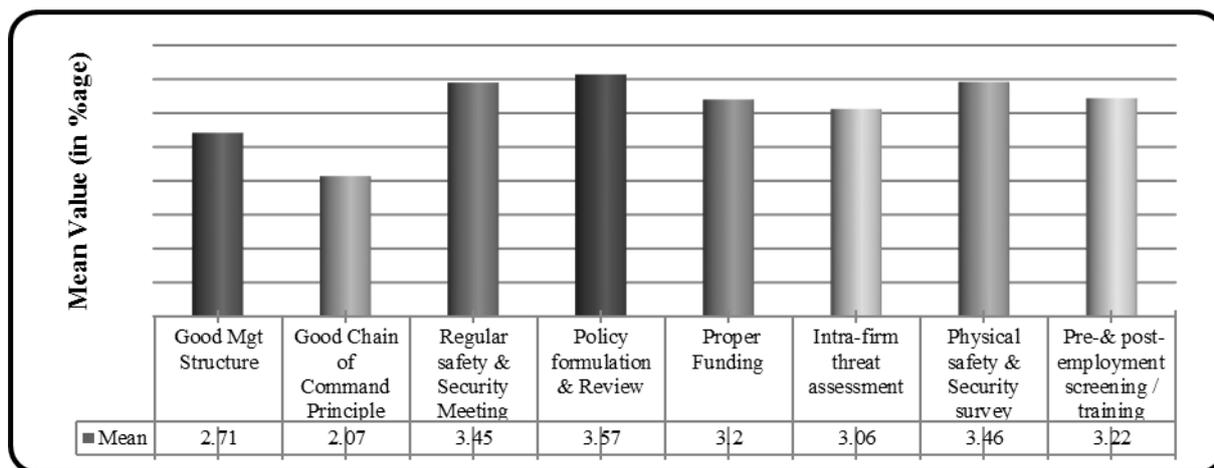


Figure 5. Pictorial presentation of the means of sources of safety and security risks in organization
Source: Constructed from Mean values on Table 8

The result of the corresponding hypothesis that good management structure, command principles, meetings, funding, threat assessment, physical survey, employment screening, and operations planning are not effective strategies for effective staff safety and security management in the University of Uyo is presented in Table 9.

Table 9. Mean Result for Strategies for Effective staff Safety and Security Management in the University of Uyo

Likert point (2)	Good mgt. structure	Good chain of command principle	Regular safety & security meeting, policy formation & review	Proper funding	Intra-firm threat assessment	Physical safety & security survey	Pre- & post-employment screening/ training	Safety & security planning operation
Mean	2.7100	2.0700	3.4500	3.57000	3.2000	3.0600	3.4600	3.2200
Harmonic Mean	2.7100	2.0700	3.4500	3.57000	3.2000	3.0600	3.4600	3.2200
Geometric Mean	2.7100	2.0700	3.4500	3.57000	3.2000	3.0600	3.4600	3.2200

Table 9 indicates that there are strategies that are effective for managing staff safety and security risks in the University of Uyo. This is because all the results had no variance and no error in their Arithmetic mean. Consequently, the null hypothesis which states that good management structure, command principle, meetings, funding, threat assessment, physical survey, employment screening, and operations planning are not effective strategies for effective staff safety and security management in the University of Uyo was rejected while the alternative hypothesis was accepted. This means that good management structure, meetings, funding, threat assessment, physical survey, employment screening, and operations planning are effective strategies for effective staff safety and security management in the University of Uyo except for good chain of command principle.

5. Conclusions and Recommendations

Safety and security are very important issue in organizational management. Today, the growth in population without corresponding growth in job opportunities create several and eminent juvenile tendencies among youths. The explosion in technology and emergent of sophisticated equipment for industrial use, among others have all rekindled academic and industrial interests in safety and security risks at workplace. From the findings made, it is concluded that the main sources of safety and security risks in the University of Uyo are more of external than internal. The principal sources are kidnapping and bombing. However, principal internal sources are Appliances/gadgets and machineries/equipment. It is concluded that the level of Management commitment to safety and security management is far less than needed to ensure effective safety and security operation.

Consequently, safety and security affect lives and properties in University of Uyo bi-directionally. That is, if managed well it will strongly protect lives and properties in University of Uyo; and if managed

with levity, it will make lives and properties in University of Uyo vulnerable to the risk of unsafe and insecure workplace. Funding is the most contentious issue in safety and security management. Thus adequate funding is the most effective strategy for managing safety and security effectively in the University of Uyo. Another most important strategy is pre- and post-employment screening/training amongst others. Based on the above findings and conclusion, the following recommendations suffice:

i. Since one of the greatest sources of safety and security threats is external to the University, it is recommended that management of the University of Uyo should seek alliance and network with law enforcement agencies within Uyo metropolis to constantly keep the University environment under surveillance, and possibly apply for armed security men who are experts in bomb detonation and anti-kidnapping operation to be placed on strategic location along the University access roads.

ii. Management of the University of Uyo should be more committed to safety and security management. One of the way this can be achieved is to make safety and security issues integral part of University's strategic pact with workforce and also by adopting the management line model – one form of management structure – where safety and security is located with other general management responsibilities.

iii. Everybody in an organization dreads risks and desire protection, especially as they may find insurance an expensive risk management strategy. The University of Uyo Management should look at safety and security management as complementary risk management strategy. When workplace is safe and secured, they will work with vigour and an intimidation-free mindset and this will lead to more employee commitment which is a recipe for organizational growth and development.

iv. Adequate budget should be allocated to safety and security department/operations. When this is done, other effective strategies such as pre- and post-employment screening/training would be possible. This is hereby recommended very strongly for security personnel in the University of Uyo.

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Global Leadership and Organizational Change from Past to Now

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Organizational theory and organizational research (namely, organizational behavior), have the purpose of organizations – to explain and understand – their origin, their existence and their functioning. Therefore, I try in my work, different approaches to take up. To this end, I chose different books and articles to explain and expand the knowledge on this subject.

Keywords: *global management, organizations models, human resource, organizational behavior*

JEL Classification: *L00, L20*

1. Introduction: Global Management - Global Management and Organizations Models in Human Resource / Organizational Behavior

The difficulty is, to explain the theory and structure behind organizational theory, because the problem is, that there is no clear standard for structuring and input. The explanations and definitions are as varied as organizations itself. Nonetheless, the concept of organization can be defined in two ways:

1. The company has an actual organization
2. The company is an actual organization

2. Literature Review on the Subject and the Notion of Organizations

2.1. The Instrumental (or Functional) Organizational Concept

The German term of Functional Organization was coined by Erich Gutenberg (Laske et al., 2008). Organization is a function of management, whose function and purpose is the fulfillment of tasks to perform. Organization sees itself as a concept of operations management, among other terms, such as planning or control (Frese, 1992).

2.2. The Institutional Organizational Concept

The institutional organization concept draws the view to the entire system, i.e. to the institution. Committed organization with long-term objectives are social communities. They have formal structures to be aligned with the help of the members on the goals (Frese, 1992).

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Article History:

Received 27 September 2015 | Accepted 5 October 2015 | Available Online 27 October 2015

Cite Reference:

Stelzer, A., 2015. Global Leadership and Organizational Change from Past to Now. *Expert Journal of Business and Management*, 3(2), pp.166-170

2.3. The Processual Organizational Concept

The procedural point of view of organizations determined the activity-oriented understanding. It describes the activities, processes and practices that made such an order, maintained and developed (Laske et al., 2008).

The current organization theory attempts to integrate institutional and procedural understanding of produce. The basic elements and characteristics that make up the organizations are:

- The targeted nature of the organization

If units join together to pursue sustainable goals, then we speak of organizations.

- The formal organizational structures

Organizations have commonly defined and formal structures, adjusted according to the actions of the organization's members.

- Membership in organizations

The non-membership or membership shall also define the membership to an organization or not.

- The design of the organization's members

The formal definition of membership means entering into a formal defined membership with an organization. Membership does not address a person, but it refers to certain acts or services.

- The boundaries of the organization

The boundaries of organizations are not natural boundaries, but are intentionally defined by people in order to distinguish organizational inner worlds and outer worlds.

The Conclusion is that Organizations represent inter-organizational and operating structure, which constantly interact with their environment (Laske et al., 2008).

3. Introduction to the Timeline of the Notion of Organizations

A temporal screening of the concept of organizational theory does not generate a general accepted theory. Because organization scientists use different methods to justify their approaches, very different assumptions or sometimes there are different interests involved (Kieser and Ebers, 2006).

The following remarks point only to a small part of the historical development in Organization Theory, because a complete list is not possible because of the large number of Theories.

3.1. Classical Approaches (Kieser and Ebers, 2006)

- Max Weber and the Analysis of Bureaucracy

The approach of the bureaucracy (namely, an efficient organizational form) promoted by Max Weber defined the performance of work in administration and is characterized by:

- Division of labor
- Office hierarchy
- Rules
- Standards

- Scientific Management and Taylorism

Taylorism was founded by Frederick Winslow Taylor and serves the increase of efficiency and productivity by management and labor.

- Administration and Management Theory

The development of management and administration theory can be traced back to Henri Fayol. The primary questions are addressed on the task and department of education in management issues and problems in corporate governance. Basis of the doctrine in the form of catalog management tasks include:

- Advance planning
- Organization
- Ordering
- Coordination
- Control

This doctrine also finds a clear statement on issues of clear hierarchy, which states that only higher-level functions can give instructions on subsequent instances.

3.2. Behavioral Approaches (Kieser and Ebers, 2006)

- Human-Relations-Approach

The origin of this theory is reflected in the Hawthorne-Experiments. In this context, the effects of job conditions were examined by work efficiency.

Main conclusion:

A positive attitude towards work by the members and managers of an organization turns to high satisfaction and this in a further step to a better performance.

The key message:

Humans are a social beings and operate on their own laws.

- Organizational development

The organizational development (OE) is based on the findings of a group dynamics laboratory method (NTL Institute) and survey feedback.

Key message:

The involved person should become part “of the game”.

OE is used in large firms, governments, churches, social institutions and the army. It uses the rules of social communities, similarly to the interests of employees.

- Motivation Theory

As a result of the Human-Relations-Approach the development of the motivation theory is following, which investigates human behavior. It examines the following relationships:

- Motivation
- Frustration
- Satisfaction
- Performance

3.3. Situational Approaches (Kieser and Ebers, 2006)

The situational approach developed in the 60 years in the U.S. and England. The aim of this approach is to detect the relationship between:

- Organizational theory
- Behavior of the organization members
- Efficiency of the organization
- Situation

4. Distinction Between Firms and Educational Organizations

Dr. Laske et al. (2008) would like to emphasize in their work the difference between business and educational organizations. Generally, both are organizations, but there are clear differences:

- Educational organizations have budgets, but are usually not profit-oriented enterprises.
- For the product "education", the customer has to join in actively, while this is not necessary the case in the goods production.
- The raw material "knowledge" is directly linked in educational organizations to the know-how supporter.
- This fact is also very aware of the knowledge holders and therefore sometimes they also can be very demanding.

Educational organizations operate in such a different way to other forms of organizations. Therefore, it would be wrong to apply existing organizational structures into educational organizations. According to Dr. Laske et al.(2008) the organizations that approach this route would not necessary have a successful outcome.

“The combination of a central concept of enlightenment (i.e. "training") with just such the economy (namely, "organization") brings a fundamental tension reflected in the productive and reflected in the "management" essential professional control of educational institutions” (Laske et al., 2008).

5. Organization and Management

In twenty years a typical large company has less than half of levels by management as today and having no more than a third of managers. The company of tomorrow will distance and clear itself from the production companies of the past (Frese, 1992). Rather, companies will become organizations of knowledge, in which the carrier will be working with and for achieving knowledge and therefore they will have new significance levels.

The organizational structures are becoming flatter again, as it has been in the story in the past. The difference is, that there are no longer actively controlled in base units, but the knowledge of the actual organization is firmly anchored. Works are collected in projects and executed in task-oriented teams.

The development of information-based enterprises through the actual organization brings many changes. To assess this possibility, it makes sense to watch already active information-based organization and their guidelines as orchestras, hospitals and administrative details.

The actors in information-based companies are specialists. The task of a manager in an information-based company is to coordinate these specialists in the "best use" possible. The task is not to train the specialists in their ability or to supplement them in their functions. These leaders must not be able to exercise their attributable functions by themselves (Drucker, 2000).

The Advanced Management Program at Harvard Business School focuses on the analysis of organizations and their optimization. But to be able to optimize, first an existing organization must be analyzed and for that the OFP Model (OFP = Organizational Fitness Profile) was developed. OFP schedule implies the following steps:

- Orientation and planning
- Data collection
- OFP Meetings

It is about an analysis of efficiency by management and in a second step to derive improvements to the structure. So, in the first step customers and employees will be asked to clarify the strengths and weaknesses (Stevens, 2002).

6. Conclusion

Organizations and Markets

The Wealth of Nations (Smith and Cannan, 2003) is divided into five books:

- The increase in the productive powers of labor and the rule that its product is distributed among the various classes of people naturally
- The nature, accumulation and use of capital
- The difference in increase of wealth in each country
- The systems of political economy
- The sovereign or the state's finances

The work is, for example, the fundamental working mechanisms of the different markets, the money economy, the factors of production and foreign trade. In this work (Smith and Cannan, 2003), specifically to Smith's division of labor in factories, and developing his theories based on the example of pin production in southern England. This book deals with the interaction of different actual organizations and their need in changing times. Much of the past is reflected in the present (Smith and Cannan, 2003).

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Upper Echelon Theory: Role of Community and Strategy

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In this paper I argue that community plays an important role in shaping the values and characteristics of top management teams. It builds on upper echelon theory to posit that community level characteristics are instrumental in framing the cognitions of CEOs and top executives. Strategic decisions made by managers in organizations represent the significant impact community has on top management teams. Examining the influence community has on top management teams provides additional implications about why certain firms perform better than others.

Keywords: *upper echelon theory, strategic management, top management, corporate governance*

JEL Classification: *M16, M14*

1. Introduction

A central theme in management is determining how strategic decision-making allows one organization to perform better than another. Separating the strategies an organization pursues from those individuals that make strategic decisions can be a critical mistake. The top management of an organization exists to a large extent to make decisions regarding the path of the organization. A great deal of literature has focused its attention on both the CEO and top management teams (TMTs), and the role they play in an organization. Upper echelon theory (Hambrick and Mason, 1984) puts forward the idea that strategic decisions are connected to the background characteristics of an organization's management. A TMT is a formulation of top-level managers and directors within a firm (Finkelstein and Hambrick, 1996) possessing specific expertise in areas that will enable an organization to make informed decisions. This expertise encapsulates the tangible and intangible knowledge and characteristics an individual possesses. According to Hambrick and Mason, individual characteristics and cognitions are developed by past experience, education, and personal values. Cognitions shaped by these, influence the way top managers analyze and respond to situations, and the strategy chosen for the organization (Kaplan, 2005).

While the personal characteristics that are generally perceived to influence the decisions of executives are experience, education, and personal values; further studies have examined additional demographics and characteristics such as CEO tenure, international experience, functional background, and age (Hermann and Datta, 2002). This paper intends to examine community's effects on the personal

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Article History:

Received 15 October 2015 | Accepted 27 October 2015 | Available Online 08 November 2015

Cite Reference:

Quttainah, M.A., 2015. Upper Echelon Theory: Role of Community and Strategy. *Expert Journal of Business and Management*, 3(2), pp.171-181

characteristics of a TMT, and the impacts strategic decision making has on and eventually the performance of the firm. Though community can be defined in a number of ways, in this paper community means the physical location which played the most instrumental role in shaping the cognitions of each member of the TMT. Thus, community can be the current location where the TMT lives, the original community in which each member grew up, or a community in which a member spent a portion of time. Individuals will often end up as managers in a new community that may or may not be similar to the community which has had the most influence on their cognitions. At that time, the individual will be faced with the decision to choose either to be flexible and allow to be shaped by the new community, or to employ previous characteristics shaped by the original community. This paper will show the direct impact a TMT's community and physical location has on decision making, as well as point out how an organization can overcome these boundaries and adapt to pressures to grow both domestically and internationally.

2. Literature Review: Theories and Propositions

One fundamental issue in strategy is explaining why firms differ in the strategies they pursue and why some firms are more successful than others. Upper echelon theory (UET) was built upon strategic leadership and suggests that individual characteristics influence differing strategic decisions by top management teams (Pfeffer and Davis-Blake, 1986). UET has received much attention and has provided the area of strategic management with good empirical data on the strategic decisions made by firms. It also explains how the performance of a firm is strongly influenced by the decisions made by top-level executives, and how the firm in Hambrick and Mason's view becomes a reflection of top management (Hambrick and Mason, 1984; Pfeffer and Davis-Blake, 1986; Smith, Carson and Alexander, 1984).

Examining how different characteristics and demographics influence top management's decisions is an important tool in explaining and predicting an organization's performance, and numerous studies have attempted to discover what some of these demographical influences are (Bantel and Jackson, 1989; Finkelstein and Hambrick, 1990; Grimm and Smith, 1991; O'Reilly and Flatt, 1989; Wiersema and Bantel, 1992). Wiersema and Bantel (1992) found that age, tenure, and education level all influence the degree to which individuals are receptive to change, willing to take risk, and creative or innovative. These characteristics will influence the strategic decisions made by top managers regarding change, risk and innovation. Other research has shown that an individual's functional background, socioeconomic roots, and financial position are linked to job involvement, job preferences, and beliefs about manager's role (Buchholz, 1977, 1978; Ritchie and Beardsley, 1978; Sekaran and Mowday, 1981). However, no research has investigated the role that community can play in influencing executive cognitions.

2.1. Community Influence

Communities influence the decisions individuals in them make, and it is difficult to imagine making a decision that is completely independent of the immediate environment in which the individual lives. For example, one may decide not to purchase a vehicle if living in a community that values the importance of and has engineered a good public transportation system. The child of a farmer may choose not to pursue higher education, because the farming community values hard work and commitment to continuing a family farm more than going to college.

At this time, it is important to make clear the concept of community as used in this paper. Community does not mean social pressures that are administered by environmental forces. Corporate social responsibility (CSR) (Engle 2006; Welford and Frost, 2006) argues that organizational leaders sometimes make decisions for environmental reasons, which may be regulated by law or encouraged by social pressure. The distinction made between CSR and how community influences the cognitions of top managers is that there is an implication of some pressure associated with the former. Instead of resulting from external pressure, community factors that influence top management's cognitions involve the integration of certain values or characteristics, present in the community, into the individual members of the TMT. Another distinction of community influence should be made from a similar theory to CSR, that of corporate social action.

Though research on corporate social action can provide support for this paper, it is also important to differentiate this idea from my argument of community influence. Corporate social action takes the perspective that corporations make strategic decisions that have social benefits for those outside the firm (Marquis, Glynn and Davis, 2007). In this context, organizational actions are intended to assist with some social problems that are present in an environment. These activities often take the form of some philanthropic purpose, and are focused on giving to or acting in a way to benefit a community (Marquis et

al., 2007). While some of the factors that encourage corporate social action may also influence the characteristics of TMTs, my focus is not on actions by an organization that are directed exclusively at benefiting the community. Each of these theories revolves around some level of external forces, which are conscious activities in response to some outside the firm pressure. I contend the influence community has on TMT cognitions, works as an antecedent to corporate social actions and corporate social responsibility practices by organizations.

UET describes how an individual's experiences and education frame cognitions and make up the values that consciously and unconsciously shape who a manager becomes (Finkelstein and Hambrick, 1990). In this paper I contend that that community shapes the cognitions of top management follows this same process, and how this becomes integrated into the values and cognitions that influence decisions made by TMTs.

Examples of community factors that can impact TMT's cognitions include geographic characteristics, technology, religious views, natural resources, local values and ideals, local preferences, communication style, proximity to large cities and industry composition. These community factors can exist in a section of a city, an entire city, a state or region, and between countries. For example, it is possible to observe these factors play out in top manager's cognitions by contrasting the characteristics of an individual living in a rural Midwest City to someone living in an urban area on the west coast. Another example would be comparing how a manager of an organization in a community where religion is very important and ideals are conservative, differs from one living in a more liberal community where values are more diverse (Fenton, 1962; Miller and Besser, 2000; Saxenian, 1994).

Work by Bourdieu (1986) and Granovetter (1973) focused on the importance of the different networks of organizations, and networking done by top managers. They found that these networks greatly enable organizations through the expansion of information and opportunities. These relationships can also establish an organization's role in the community, such as top executives holding community positions on different councils and boards (Johnson, Daily and Ellstrand 1996). This involvement in and with an individual's community would undoubtedly create an internalization of the values and characteristics held by that community. Research also shows how association between top managers and the community develops relationships of trust between community and the organization (DiMaggio and Powell, 1985). Such trust would create loyalty by the people of the community for the organization, which would have positive implications for the performance of a firm. Organizations would benefit from this loyalty by members of the community preferring their products and services over those of other firms.

To study the influence community has on the cognitions of TMTs, it is important to look at the decisions an organization makes and how these decisions can vary by community. Marquis et al., (2007) describe how the community in which an organization exists influences how it spends money. They suggest that communities such as Minneapolis encourage philanthropic giving more so than the Silicon Valley area. It has also been found that an overwhelming majority of organizational spending takes place in the city of the headquarters of a firm (Guthrie, 2003).

Additionally, Saxenian (1994) describes the influence community has on an organization's decisions. She gives a number of examples of different managerial decision-making patterns across a wide range of locations. Much of her focus is on how living in Silicon Valley influences decisions differently than many other areas around the country.

One example of community focus can be seen at John Deere, which was founded and is headquartered in the United States on the border of Iowa and Illinois. John Deere has spent a lot of money in that region, building museums and community centers, and sponsoring a number of community events such as the John Deere Open golf tournament (<http://www.deere.com>). This example provides strong support for the influence community has on the decisions and priorities of an organization. It is important to point out that the act of giving back or spending money in a community is not necessary for how the community influences cognitions of TMTs, but often shows what values a community possesses that become conjoined with the values of top executives of an organization. Notice how corporate social action fits into the model not as a directly necessary component, but as an alternative outcome in the framework.

Community can also be explained as a group in which an individual lives. Individuals have a psychological need for relatedness, and seek relationships that create emotional bonds. These relationships are important and are often formed by the desire to associate with those who are "like us." Research on social identity theory has found that people associate with certain social groups and as a result identify with that group (Foley et al., 2002; Hogg and Terry, 2000). This finding is consistent with how TMTs would associate themselves with a particular community and identify more with that group. Forming this kind of identity has a strong influence on the values and characteristics that shape an individual's cognitions. This

influence fits the framework of upper echelon theory, and how the decisions made by top executives are influenced by social identity with a community. These distinct community effects can be seen between cities, states, regions, and countries.

Previous research has shown that community has a large impact on family firms (Anderson and Reeb 2003), but not much work has focused on community's influence on public firms. Arguments could be raised that community is irrelevant in large public companies that might already exist in a number of regions and countries and have numerous headquarters. However, I would argue that this cannot be generalized, since many companies do have one primary physical location where the decisions makers reside. Research also indicates that 35% of large public firms, from a broad range of industries in the United States are family owned, and that community plays a major factor on how these organizations operate (Anderson and Reeb, 2004; Lester and Cannella 2006; Shultz et al., 2003). This and other research has examined the relationship between family-owned corporations and firm performance.

I would argue that there is a high correlation between the cognitions of family-owned firms and the values of public firms whose TMTs are shaped by one community. Lester and Cannella (2006) draw this comparison, and show how community-level effects, on groups of people and organizations, provide a frame of reference for the actions of the organization. They demonstrate how networks between family-owned firms and community result in what they refer to as community-level social capital. The idea of community-level social capital is driven by the connection with a community through shared values, trust, social norms, and support of the community. The benefit of such networks on family-owned firms can also be realized by public firms that establish the same type of relationships. By exhibiting the same connections with the community, a public corporation will also garner the support of the community.

Another recent area of study, which points to the correlation of community level characteristics and organizational decision making, refers to local knowledge spillover (LKS). Knowledge spillover takes the form of intellectual development through direct or indirect exchange of information that has greater value to the acquirer than the amount for which it was paid (Feldman and Florida, 1994). In this sense, just by being in a certain geographic area, managers can gain knowledge that is free to them as long as they are capable of incorporating it into the firm's strategy.

The knowledge gained from LKS is widely understood to impact innovation, learning and growth capabilities of organizations. Research on LKS has been combined to advocate that knowledge spillovers are bound to a particular location (Kesidou and Romijn, 2008). This discovery implies that knowledge spillovers being produced and acquired is a result of characteristics found within a community. Knowledge spillover can take the shape of intellectual resources, values, ideals, and preferences of a location that become engrained in the cognitions and values of those individuals that interact in the community. These all provide further evidence that community factors influence the cognitive characteristics of TMTs in that location.

Proposition 1: A TMT's community plays an instrumental role in shaping their cognitions and values, which directly influence strategic decision making.

2.2. Organizational Expansion

The main objective of a TMT is to create value for the organization by increasing firm performance. One strategy often used to increase the value of a firm is to grow the business beyond its current position. Though research contributes conflicting results on the positive impact of organizational growth, there is often still pressure on a company to expand, which leads to growth as a common business strategy. When this strategy is pursued, it is not uncommon for a company to expand to another city, state, region or country. TMTs face many challenges when moving into different areas and sometimes must make adaptations to coincide with the new location. Decisions made resulting from cognitions influenced by a particular community may not be a strategy that creates positive performance in another community or area. It makes sense then to infer that an organization's TMT will not face as difficult a challenge if the firm expands into a community that is similar to the community in which the headquarter exists.

Attributes of a particular community have a tremendous impact on individuals and organizations within that community. Since it is clear that these attributes such as religion, local ideals, social norms, and communication styles are not shared by every area, it is recognized that differences in them can create tension or some sense of distance between communities (Ghemawat, 2001). This is often observed as cultural differences, which can be described not only as uniqueness between countries, but also as societal diversity at the community level. These distinctions can impact the effectiveness of certain managerial practices when they are practiced in a community other than the current community of a TMT. This suggests that the success of managerial practices depends on how the cognitions and values of a TMT fit within another community (Hofstede, 1993; Kirkman and Shapiro, 1997; Mendonca and Kanungo, 1994; Schneider,

1988). The need for a fit between the values of an organization's top management and the values of a community suggests that a TMT would be more successful at managing firms in a similar community. In fact, Davis and Greve (1997) found that of the top executives hired by large firms, 32% of those came from organizations with the same area code and 39% came from organizations in the same state. This is a product of successful decision making in one area and the correlation between a TMT's cognitions and the community. Though their study represents the fit of top executives within a community in the same state or area code, physical location is not the only necessary factor moderating the relationship. This fit can be experienced in communities that do not share a geographical closeness, but instead share the community-level characteristics expressed in the values of a TMT.

There are a number of factors that influence how an organization will perform when it expands into a new region. The people that make up the community play an immense role in the connection of a TMT and the community. When top management shares the same values, perceptions, preferences, behaviors and goals of the community in which it operates, there will be a level of integration between the organization and the environment (Triandis, 1994). When organizational strategic actions, within the UET framework, influenced by the cognitions and values of TMTs, fit within the cultural norms and values of a community, that community will begin to associate with the organization (Hofstede, 1980; Schwartz, 1994; Triandis, 1995). Trust has been proven to greatly influence the relationship between an organization and the community.

DiMaggio and Powell (1985) point out that when trust exists between a community and the members of an organization, they will connect with the organization which will promote successful performance. Trust can be gained informally through shared values and norms, which we know can develop into formal networks and social structures through which TMTs can connect with a community. These networks can encourage a relationship between a community's preferences and its habits as a consumer. When an organization connects with a community, the citizens will often develop preferences for that firm's products and services as well as begin to identify with the organization (Ghemawat, 2001). These preferences and associations with an organization can exist not only as a result of a physical connection, but by the sharing of values and norms. So if the values and cognitions of a TMT allow it to gain a connection with one community, I suggest that they will also help build connections with other communities that share those same values and norms.

Proposition 2: TMTs will be more successful when expanding to communities that are similar to the headquarters community.

The previous section focused on the benefits resulting from expanding to a community that is similar to top management's current community. This section will turn our attention to the costs associated with expanding to a community that is dissimilar. The challenges a TMT faces when a firm has more than one physical location or is going to expand into another region can be very difficult to manage, especially if that other location is in a community that does not share the characteristics of the headquarters' community. Top management must possess the ability to connect with the local culture and fit within a community. Many of the values and characteristics of TMTs that allow an organization to conform to a particular community may be in direct conflict with the values and characteristics possessed by another community.

This can lead to choices made by top management that result in practices that are detrimental to the performance of the organization. Ghemawat (1997) provides an example of a television programming company that moved into another region confident that it would realize financial success. Instead of financial gains, the company experienced great financial loss because of the difficulty of operating in a different area. The TMT failed to base its decisions off the cultural characteristics of the new market. By focusing primarily on the opportunities that a new location might present, many organizational leaders fail to be attentive to community level characteristics that often have more influence on the performance of a firm than perceived.

Galaskiewicz (1997) explains that the TMT of a firm in Silicon Valley would possibly make decisions that would appear stingy to the people of Minneapolis, because of the value Minneapolis places on giving. A management team may not even realize that a decision they choose may have adverse consequences when they are used to managing firms in a community that has a different value structure. In addition to cultural differences that may create barriers for a TMT to effectively manage in another community, administrative and governmental aspects may pose a different type of challenge. This does not just mean the regulatory implications that arise through performing business in different regions. Different communities, districts, and certainly countries might have tacit rules that organizations inherently follow. These rules are informal policies that top management in those areas knows because it is associated with the values of the community.

If a TMT expands into a community, and does not know to follow these unspoken rules, they may make decisions that will hinder relations with the people in the community. In addition, just because a certain community or area appears to be an attractive market, does not mean that a community will be welcoming to an outside TMT. Ghemawat (2001) found that governments will often take actions to prevent outside organizations from controlling their market. People in certain locations will also take a stand against outside firms expanding into their community. We commonly see this resistance with Wal-Mart and other mega-retailers trying to move into many communities where the residents do not believe the organization shares their values (Bronn, 2006). This resistance can also be seen in articles on websites such as walmartwatch.com and reclaimdemocracy.org/walmart/. These examples point out the challenges many TMTs will face when they attempt to move into different areas, particularly when the community is different from the one that has shaped them.

Proposition 3: A TMT will be less effective at managing the firm if they choose to expand into a community that is dissimilar to the headquarters' community.

2.3. Overcoming Boundaries

When a TMT is influenced by a community, there will be challenges to overcome in order to make successful strategic decisions in different communities. Though expansion to a new area will increase the challenges, there are several ways in which an organization can overcome these challenges by lowering and raising the boundaries of community shaped cognitions. One measure a firm can take is in regards to top management team diversity. Organizations in today's business environment often have top management teams that are comprised of a diverse conglomerate of individuals. When the cognitions of numerous top managers have been shaped by different community level factors, the decisions made by that TMT would be different than if they were all shaped by the same community. A TMT with a diverse community background may be able to perform better than a TMT with a homogeneous community background if the company expands into a dissimilar community to the headquarters. There has been a stream of research that focuses on the effects of organizational diversity on firm performance. Studies have also attempted to measure the effects of diverse TMTs on the performance of a business.

Research by Lyon and Ferrier (2002) looked at demographic characteristics and found a positive relationship between TMT heterogeneity and performance. They found that the strategic decisions of a TMT with diverse demographic characteristics lead to creativity and increased innovation. Other studies however have found that TMT heterogeneity can also negatively affect an organization by increasing the possibility of conflicts (Chatman and Flynn, 2001). To examine whether a TMT that has been shaped by the values of multiple communities would perform better in a specific community, it would help to know the culture of the community to which a firm wishes to expand. To test the impact of demographic diversity on TMTs in other cultures, Wei et al. (2005) conducted research on organizations in China. They set up interviews in a number of organizations to find the demographic backgrounds and team diversity of top management. Consistent with other research examining this relationship, they found mixed results of TMT heterogeneity and firm performance. Occupational experience of the TMTs was found to have a positive effect on firm performance. Variable occupational experiences would be influenced by community level factors, so TMTs with backgrounds from multiple communities would manage more effectively when operating in a different community.

There is another benefit that a TMT with multiple community characteristics can achieve for an organization. This benefit would take the form of social capital resulting from networking, which forms community level relationships. The development of these relationships with members of a community does not happen through one individual, but instead through the interaction of different individuals of an organization with different groups within a community (Bourdieu, 1983). Any given community will also exhibit multiple sets of values and cognitions that are not always congruent among all community members. So it may benefit an organization to have top managers with different sets of community influenced cognitions, in order to match the different sets of values present in the new community especially if it is dissimilar to the current one. It is helpful to draw a comparison between this relationship and the benefits seen with interlocks among boards of directors. Interlocks have been found to provide a connection with some environmental factor that the firm would not otherwise possess (Pfeffer, 1972).

Interlocks can often help a firm to co-opt to form a bridge by which information and knowledge can be acquired by an organization. The number of interlocks a firm has within its directors often aids TMTs to manage more effectively. When the values of top executives create a connection with a community, it will allow the managers to co-opt with certain social networks that may provide information and knowledge that will aid in decision-making. Upper echelons with a broad range of values and cognitions will be able to

connect with different groups within an area, which will increase the avenues through which the organization as a whole can acquire resources through social capital. Having top managers that have been influenced by a diversity of communities will thus increase the TMT's effectiveness of decision-making in a dissimilar community.

Proposition 4a: A TMT that has been influenced by a diverse range of communities will perform better if the organization expands to a location that is dissimilar to the headquarters community.

Another logical thing upper echelons can do to overcome the boundaries of cognitions being framed by community is to move into communities that are similar to the current location. One-reason firms fail or at least fall short of expectations when entering new markets is because the organizational culture does not align with that of the new area. When this lack of fit exists between the values and cognitions of community and the TMT, an organization will consequently experience negative implications (Robert et al., 2000). In order to increase the likelihood of benefiting from expanding, a TMT can look for symmetries with different communities. Organizations also need to realize that networks that encourage fit often extend beyond the current boundaries of the community (Lester and Cannella, 2006). By looking for communities that share the values and characteristics of the current community, an organization can employ a growth strategy into other communities, while still matching the cognitions of management with the new community.

Proposition 4b: A TMT will benefit by looking for communities that share the same values and characteristics of the headquarters community.

Another thing executives must be aware of is the social norms and values of the community to which a firm is expanding. A TMT cannot assume that another community will share the cognitions and values they have developed by residing in a particular community. Even when the geographic distance is minimal, differences in social norms, which should not be overlooked, may still exist (Deans and Larson, 2008). Ghemawat (2001) indicates that it is important for TMTs to be aware of administrative and political factors such as laws, regulations, and historical attributes that will impact a firm's decision to locate to another community. Acting in accordance should decrease the resistance not only by the members of the community, but also by the administrative and governmental entities of the area. These characteristics can be accounted for by the entry mode chosen by an organization. Herrmann and Datta (2002) studied the impact of CEO background characteristics on CEO succession and the choice of entry into a new market, such as wholly-owned subsidiaries, joint ventures, and contractual entry modes. TMTs can consider these findings when deciding to expand into a new community. When the values and cognitions of a TMT do not align with those of the community in which they want to expand, it might be wise to consider different modes to entry. Knowing the social norms and values of the new community will allow the firm to make effective decisions.

Proposition 4c. A TMT will be more effective at lowering the boundaries of community shaped cognitions when it knows the social norms and values of the new community.

A TMT can also overcome the boundary of community influenced values and cognitions by looking for opportunities where current social networks or bonds with a community either already extend to other areas or offer avenues through which networks can be extended. Executives can also utilize a growth strategy based off the practices of another entity. In a study of law firms that expand internationally, Pinto (2008) found that some law firms base the decision to enter a new area on where other businesses enter. Law firms that represent an organization that enters into a new area found success when they expanded to the same location. This creates a relationship that assists the organization to quickly achieve effective performance, and also allows an organization to avoid some of the boundaries that would exist without a preexisting relationship. This strategy would not work for organizations in any industry, but could definitely benefit one with business customers that expand to new communities.

Proposition 4d: TMT's will be more effective by expanding to communities where social networks already extend or by following others with whom a relationship exists.

3. Discussion and Conclusion

This paper focuses on what upper echelon theory says about the cognitions and characteristics that influence the strategic decisions of top management teams. While previous studies of TMTs have focused on how experience, education, and personal values structure cognitions and characteristics of upper management, there has not been any research that examined the impact the TMT's community has on these cognitions. I have provided an explanation that shows a relationship between the values possessed by a

community and how that frames the cognitions of an organization's top management. The impact of community on TMT cognitions was also examined as a contributing factor of firm performance in multiple communities. I argued that when one community has shaped a TMT's cognitions, they would be more successful at managing an expansion of the firm into a community with similar values. Further, that a TMT may be less effective at managing an organization if it expands into a community that has values and characteristics that are dissimilar from those of the headquarters' community. Another implication of community influence on top executives considered the makeup of the TMT. I showed that a TMT comprised of individuals that have been shaped by multiple diverse communities, will likely have a unique set of cognitions that influence decisions. A TMT that has diverse values and cognitions influenced by multiple community level factors will likely be better suited for managing an organization when it expands into a community that is dissimilar to the current community. The cognitions and values of one community that influence a TMT can place boundaries on an organization that can affect firm performance. I explained some ways in which TMTs can overcome these boundaries and adapt in order to be successful in various communities and areas.

Though effects of TMT's relationships with community as a key to building social capital to benefit the firm are mentioned, the impact community has on the directors of an organization is not mentioned. Many companies use directors as interlocks to co-opt with environments outside the firm. Directors are used to attain access to particular resources or knowledge to which the firm would not otherwise have access. Further studies could look at the impact community has on the governance structure of an organization to benefit the growth strategy of a firm.

I also compared and contrasted corporate social responsibility and corporate social action with communities influence on the cognitions and characteristics of TMTs. Those theories revolve around the organization doing something for the community, but do not necessarily encompass the influence community has on values and cognitions possessed by TMTs. It would be interesting to see how decisions made by top executives with values shaped by a community, would result in practicing corporate social responsibility and taking corporate social actions. This could be one way to measure the way community shapes the cognitions of top executives, by looking at the corporate social actions an organization take. I also suggest that communities would differ regarding the strength with which it influences top executive's cognitions. Some communities would greatly affect values and cognitions, while others would have a more moderate impact. Future work could examine the role different types of communities have and the implications of that on the cognitions of top management in those communities.

Upper echelon theory was introduced to explain the central issue in strategy of why firms differ. It focuses on the impact top management teams have on this difference, and how it affects firm performance. Recognizing how community influences the cognitions and values of TMTs will help to explain differences in the decisions among a variety of firms. It also provides evidence for why one firm may perform better than another in a given location. Knowing how community influences impact the cognitions of TMTs will also help an organization that wants to expand into a new community. Understanding how community influences the cognitions and strategic decisions of a TMT will affect the future direction of a firm and explain how it impacts a firm's performance.

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The Impact of SOX Adoption on the Compensation of Non-US Companies' Boards: The Case of Canadian Companies

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The purpose of this article is to study the relationship between the adoption of the Sarbanes-Oxley Act (SOX) and the compensation of the board of directors of Canadian companies listed on US stock markets. The SOX act, promulgated on 30 July 2002 and the rules adopted by the Securities and Exchange Commission (SEC) require, among furthermore, a majority of independent directors on boards. The literature focuses on two main differences between US companies and Canadian companies: more concentrated ownership and the smaller market capitalization of Canadian companies. Therefore, a consistent application of SOX on all the companies that differ at the base, in their size and structure, may have a different impact on the costs of compliance. Using a sample of 17 Canadian companies listed on US stock exchanges from 2001 to 2004, our analysis show that there is a link between the adoption of SOX and the increased in the cash compensation of the board of directors. The results also show that the effect of SOX is different depending on the company's size.

Keywords: SOX, Board of directors, Board compensation, Canadian companies

JEL Classification: G380

1. Introduction

The US regulations including the Sarbanes-Oxley Act (SOX), the rules adopted by the Securities and Exchange Commission (SEC), the New York Stock Exchange (NYSE) and National Association of Securities Dealers (NASD) focus on the importance of independent directors on the board of directors and its committees. SOX focuses mainly on the audit committees of public companies. Article 301 (Public Company Audit Committees) requires that each member of the audit committee be independent. The rules adopted by the NYSE and NASDAQ require companies to have a majority of independent directors and compensation committees and appointment / fully independent governance. (The SEC Release No. 34-48745).

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Article History:

Received 15 October 2015 | Accepted 28 October 2015 | Available Online 14 November 2015

Cite Reference:

Serdiuc, N. and Khemakhem, H., 2015. The Impact of SOX Adoption on the Compensation of Non-US Companies' Boards: The Case of Canadian Companies. *Expert Journal of Business and Management*, 3(2), pp.182-188

According to several authors, board independence is important for the preservation of shareholder wealth (Berle and Means, 1932; Fama and Jensen, 1983; Jensen, 1993). However, the effectiveness of independent directors is limited due to information asymmetry compared to the internal board members. Indeed, most studies find no significant relationship between board independence and firm performance (Agrawal and Knoeber 1996; Bhagat and Black, 2002). Also, several authors have shown that there is an increased cost due to increased regulation (Wintoki, 2007; Bruno and Claessens, 2010; Litvak, 2007; Butler and Ribstein, 2006). Besides Linck, Netter and Yang (2009) found that the application of SOX increases the costs of remuneration of the directors by increasing their workload and their risks. Chhaochharia and Grinstein (2007) found that high compliance costs of new regulations have had major consequences for small businesses.

The purpose of this article is to show the impact of the application of Sox on other companies than American companies in term of board fees. Our goal is to analyze how does SOX, which is an international law enforcement, affected the costs of remuneration of directors of foreign companies such as Canadian companies listed on US markets. Indeed, SOX does not apply only to US companies, but all companies whose securities are traded on US exchanges (Litvak, 2007). Many of these companies are non-US companies with multiple differences such as the company's structure and size.

According to Gray (2005), in the case of Canadian companies, these differences imply first, a more concentrated ownership, compared to US companies. This feature could be decisive for the increased independence of the Board.

Another difference is the fact that many Canadian companies are characterized by a market capitalization which is smaller than US. Canada unlike the United States, do not have a national securities commission and is characterized by a large number of actors involved in the regulation of financial markets (Carnaghan and Gunz, 2007).

The cross listing of Canadian companies allow us to conduct this study. In addition, mandatory vs voluntary approaches (Canadian regulation on board of directors is non-mandatory, e.g. policy Statement 58-201 in Canada. See Khemakhem, Baillargeon and G elinas (2014) for further information.) and the different dates of entry into force of governance reforms in both countries are favourable to the realisation of this work. There are several studies that have examined the analysis of the costs and benefits of SOX on US companies (Butler and Ribstein, 2006; Linck, Netter and Yang, 2009; Wintoki, 2007), or foreign companies (Litvak, 2007). However, the analysis of the impact of SOX on the costs of remuneration of Canadian boards remains little explored in the literature.

Our analysis contributes to the debate on the uniform application of SOX on all the companies listed on US exchanges, including foreign companies whose country of origin have different laws and practices.

Our results show that there is a link between the entry into force of SOX, which imposes certain characteristics of the board, and the costs of remuneration of directors of Canadian companies listed on US stock markets.

2. Literature Review and Hypotheses

Several studies show that the introduction of new rules may affect the value of the firm. Indeed, Chhaochharia and Grinstein (2007) and Wintoki (2007) find that SOX in the US has negatively affected the value of some US companies.

Wintoki (2007) emphasizes the fact that it is the small companies that have suffered most from the implementation of SOX because of higher costs. His results indicate that boards are generally structured according to economic efficiency and maximizing the company's value. Therefore, a company whose optimal board structure requires more internal directors on the board could have less benefit from the new governance rules requiring more independent directors on the board.

Arcot and Bruno (2005) argue that the rules of governance are an exercise of checking boxes for businesses, where more marked boxes means better corporate governance. If the effectiveness of corporate governance following the adoption of SOX is still estimated in the years that follow, compliance costs them are more obvious. To meet the new requirements companies must assess and document their existing control systems, determine what changes are necessary to improve these systems to implement the changes and test the effectiveness of internal controls established. The costs of achieving these tasks include increasing salaries and benefits, external consulting fees and new and appropriate technologies (hardware and software) (Eldridge and Kealey, 2005). In addition, the increased responsibility of directors and officers, generated by this wave of regulatory provisions, serves to discourage entrepreneurial behavior (Gray, 2005).

The compliance cost with SOX is according to different estimates in the tens of billions of US dollars (Gray, 2005). This significant financial burden fell disproportionately on small companies before SOX, had fewer outside directors that large companies according Linck et al. (2009). Indeed, their study shows that spending by smaller companies towards the compensation of directors appear to have greatly increased. According to this, they went from \$ 21,688 to \$ 40,783 for medium enterprises between 2001 and 2004. For small businesses, compensation for outside directors increased from \$ 7.25 to \$ 9.76 per \$ 1,000 in net sales during the same period, compared to an insignificant increase of \$ 0.20 per \$ 1,000 in net sales for large companies.

The costs of SOX compliance are disproportionate specifically for small businesses. To avoid SOX, some small businesses have chosen to become private, or to reduce the number of public registered shareholders below 300, which is the application threshold imposed by the Securities and Exchange Act of 1934, including SOX belongs. Butler and Ribstein (2006) conclude that there is no justification to impose new laws, even if they could reduce fraud, and as long as compliance costs outweigh any potential benefit from the reduction of fraud.

In this regard, Morgenstern, Nealis and Kleinman (2004) argue that the small cap issuers generally have a more limited financial strength (often with less experience in the public sector) and major emitters. Small businesses, according to these authors, have sometimes only one financial officer and no internal staff. CFOs of these companies regularly play multiple roles in finance, administration and operations. These transmitters may find that management spends a lot of time to the disclosure required by the SEC and compliance rather than operations and profitability.

Morgenstern, Nealis and Kleinman (2004) and point out that small issuers that have insufficient resources and a limited number of qualified administrators, will be less able to recruit, reward, or retain the talent needed. Their empirical data show that the costs of administrator's retention increase when the size of the company decreases. Morgenstern, Nealis and Kleinman (2004) conclude that the Sarbanes-Oxley (SOX) must be reconsidered with a significant sensitivity of its impact on mid-cap issuers, private companies and general capital markets. For SOX achieve its objectives, the rules must make a stronger distinction between issuers by market capitalization or income.

Bruno and Claessens (2010) found that strong governance practices are less profitable for small businesses, probably because of the high costs in terms of monitoring, time and resources that exceed the benefits. The same authors argue that it is better to leave the control of managers to market forces and that SOX imposes an unnecessary bureaucratic weight.

In this vein, we look at the consequences for foreign issuers subject to SOX, including Canada and whose capital structure is different from that of US companies. Because of their activity, many Canadian companies are subject to US regulations. There are several differences between the Canadian and US regulations relating to governance, namely the adoption approach (mandatory / voluntary) or the effective date but also in the financial structure of the companies (Carnaghan Gunz, 2007). Indeed, Canadian companies are characterized by low market capitalization compared to the US. Canadian companies also have a more concentrated ownership and higher homestead that US companies. In Canada, the regulations relating to the Board of Directors is mostly voluntary. Indeed, the independence of the board is not mandatory in Canada.

Given these characteristics, we expect that the costs relating to the remuneration of directors in Canadian companies, subject to US regulations, be increased after the adoption of SOX and the fact that this increase is different depending on the size of companies. We therefore test the following hypotheses:

H 1: The adoption of SOX increases the board of directors' fees of Canadian companies listed in US financial markets.

H 2: The effect of the adoption of SOX depends on company size.

3. Research Methodology

3.1. Sample Selection and Data Collection

Our starting point is the set of Canadian companies listed on US stock market from 2001 to 2004 before the entry into force of Canadian regulation. Financial sector companies are eliminated cause of their special regulations. Companies that have experienced significant variations in size are eliminated to allow us to analyze the size effect.

The final sample was 17 for a total of 64 firm-year observations. Table 1 details the sample selection.

Table 1. Sample Selection

	Total
Listed companies in both Canadian and American stock markets from 2001 to 2004	122
Companies whose total assets doubled or decreased by half between 2001 to 2004	34
Financial companies	12
Delisted companies between 2001-2004	32
Missing data	44
Total	17

Data collection period is from 2001 to 2004:

- From 2001 to 2002 – is the period of time before the implementation of SOX.
- From 2003 to 2004 – is after the implementation of SOX and before the adoption of the Canadian regulations on board of directors (Canadian regulation on board of directors, especially policy Statement 58-201 is adopted since 2005).

Data on the remuneration of directors were collected manually in circulars available at SEDAR.com. Financial data are extracted from the Global Compustat database.

3.2. Proposed Model

We use the following model:

$$\text{Compensation} = \text{Post SOX} + \text{Size} + \text{ROA} + \text{MTB}$$

With:

Compensation: cash compensation of the board of directors.

POSTSOX: dummy variable; 1 for 2003,2004 and 0 otherwise.

Size: Log of market value of equity.

ROA: Return on assets ratio.

MTB: Market to book ratio.

4. Analysis and Results

We use the analysis of covariance (ANCOVA) due to the small sample size. The ANCOVA analysis is a statistical method to test by a general linear model, the effect on a continuous dependent variable of one or more categorical predictors, regardless of the effect of other continuous quantitative factors, known covariates. In other words, the ANCOVA is a combination between an ANOVA and a regression.

Moreover, Tables 2 and 3 show that there is an increase in board compensation after SOX (see the middle that increases after SOX). The tables of descriptive statistics show that the direction of change is positive (the mean before and after SOX).

The tables 2 and 3 show that, after SOX application, the mean remuneration increases. The SOX variable has a significant effect on the cash compensation of directors in table 4. These results support our hypothesis (H1).

It demonstrates that SOX increases the costs of remuneration of directors of Canadian companies listed on US financial markets.

Table 2. Board Cash Compensation before SOX (Mean compensation for 2001-2002)

No. of observations	Mean	Standard-Deviation	Minimum	Maximum
34	18 671.18	12175.51	2 500.00	50 000.00

Table 3. Board Cash Compensation after SOX (Mean compensation for 2003-2004)

No. of observations	Mean	Standard-Deviation	Minimum	Maximum
34	25 316.76	17161.79	7 500.00	100 000.00

We carried out another ANCOVA analysis to find if SOX has had a different effect on small and large companies. We used the interaction between the variable size and variable SOX. Table 5 presents the results of this analysis. We see that the interaction (Size* SOX) is significant (Table 5) it confirms our hypothesis H 2 and indicates that the effect of the law is different depending on firm size.

Table 4. ANCOVA - SOX effect on board compensation

Variables	DDL Num.	DDL den.	F	P value
SOX	1	46	7.83	0.0075***
Size	1	46	5.10	0.0286**
ROA	1	46	0.19	0.6651
MTB	1	46	5.88	0.0193**

Note: *** sign. at 1% ** sign. at 5 %* sign. at 10 % level.

Table 5. ANCOVA - Combined effect of SOX and companies' size on board compensation

Variables	DDL Num.	DDL den.	F	P value
SOX	1	46	18.36	<0.0001***
Size	1	46	3.98	0.0520*
SOX *Size	1	46	4.50	0.0394**
ROA	1	46	1.65	0.2049
MTB	1	46	2.17	0.1479

Note: *** sign. at 1% ** sign. at 5 %* sign. at 10 % level.

Where:

Independent variable: directors' cash compensation.

SOX : dummy variable ; 1 for years 2003,2004 and 0 otherwise.

Size: Log of market value of equity.

ROA : Return on assets.

MTB : Market to book.

The results show that there is a link between the entry into force of SOX that imposes certain characteristics of the board and the directors' cash compensation of Canadian companies listed on US financial market. The cash compensation of Canadian boards increased after the implementation of the Sarbanes-Oxley Act in 2002.

5. Conclusion and Discussion

The literature highlighted the impact of board independence on the financial performance of the firm (Agrawal and Knoeber 1996; Bhagat and Black, 2002, Bhagat and Bolton, 2008). Other studies such as Bruno and Claessens (2010), Butler and Ribstein (2006) Litvak (2007) and Wintoki (2007) found a significant compliance costs for US companies following the enactment of SOX. However, very few studies have addressed the impact of SOX on the costs of compliance of foreign inter-listed companies in US stock exchange. However, it is interesting to study the effect of a uniform application of SOX on all the companies on US exchanges, including foreign and whose country of origin are characterized by different laws and governance practices of the US.

The Canadian context offers a special opportunity for research because that the most part of the voluntary on board is non-mandatory. In addition, the different dates of entry into force of the respective reforms in both countries allow the realization of the study.

Our results confirm that there is relationship between the adoption of SOX and the remuneration of directors and that, controlling for the ROA ratio, MTB ratio and for the size variable.

We find that the cash compensation of the board increased after the implementation of the Sarbanes-Oxley Act in 2002. This may be attributed to the increase of tasks and responsibilities of the board after SOX and consequently an increase in his pay.

Our findings join those of Linck, Netter and Yang (2009) regarding the effect of SOX depending on company size. Moreover, we find that SOX has influenced in different ways small and large companies. Company size seems to be a main factor influencing the increase of board cash compensation.

Combined with SOX entry in to force, the company size has a significant effect on board compensation indicating that the impact of SOX adoption depends on company's size.

The compliance with the provisions of SOX could be more difficult for smaller size companies than for larger ones and this is due to their ability to face the increase of compliance cost.

The compliance fees could also be a barrier for small non-US companies for being listed on US stock markets.

Our results may suffer from certain limitations inherent to the sample selection and variable measures, including the dependent variable, the remuneration of directors. Note that, in contrast to other

studies (Linck, Netter and Yang, 2009; Wintoki, 2007), which use the total compensation (cash compensation and options), we use only cash compensation. This choice is result of insufficient or even the lack of data on options compensation for several Canadian firms. Some limitations of generalizability of the results are due to the small number of sample firms. Conducting the study on a larger sample and more years will allow better generalizability of the results. Also, our study did not reveal the quantified impact of increased costs for Canadian companies. Future research may investigate the effect of SOX on increased cost and financial performance of non-US firms listed on US capital market.

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Supplier Analysis of the IMMEX in Sonora

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The objective of this research is to identify the factors that prevent the local supply in Sonora from having a bigger development in the export industry. The research methodology consisted of deep interviews to ten companies and their supervisors that we considered to be the most successful, as well as the application of a survey to 40 other companies. We have created a diagnosis of the actual factors affecting the low recruitment of Mexican local suppliers by the industry. The idea was to provide the information that we find interesting and relevant to industry associations and Council of State for decision-making that can help increase the supply for the local market and to big companies.

Keywords: Supply, IMMEX, Sonora

JEL Classification: M10

1. Introduction

According to Carrillo and Zarate (2003), the development of local suppliers promotes growth, employment and economic stability, but face unequal footing with large foreign companies to sell their products. In Mexico, we have more than 728 economic units belonging to the electronic sector. Manufacturing companies are located mainly in states like Baja California, Chihuahua and Tamaulipas, giving jobs to approximately 258 000 people in the country, according to the National Institute of Statistics and Geography (INEGI) (promexico.gob.mx).

Following the figures of the Ministry of Economy (2001), between 2000 and 2010, the foreign investment in the electronics sector was of 625 million dollars, focusing mainly in the manufacture of computers and equipment. Despite the efforts of the private sector and the Mexican government, the participation of the National Procurement in the Manufacturing and Export Services (IMMEX) in its 40 years of presence in the country, has been relatively low. In 2004, the national turnout was 10% of intermediate consumption, this being even a lower involvement in the area of raw materials (Koido, 2003). Contreras (2000) notes that the National Border Program was established in 1960, from which the industry has become the most dynamic sector of the Mexican economy.

There is an idea that NAFTA is related to a more dynamic growth. However, in 2001 there was a significant movement of employment in the industry. For some reason, this movement of employment has something to do with some factors impacting the industry, including critical clauses in the context of NAFTA. The dynamism of the industry has generated a development in the market, which has been perceived as the passage of a dynamic core of the border economy to the most successful model of

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Article History:

Received 31 October 2015 | Accepted 12 November 2015 | Available Online 23 November 2015

Cite Reference:

Jaime Meuly, R., 2015. Supplier Analysis of the IMMEX in Sonora. *Expert Journal of Business and Management*, 3(2), pp.189-193

industrialization. Cities that are known for economic and industrial development, have created associations. Studies Carrillo and Hualde (2001) point out that local plants do not have the resources to produce inputs with high standards of quality and high technological level that are certainly required. Transnational corporations have to turn to foreign suppliers that have located their plants near its customers.

Also, according to the college of the north border (COLEF, 2002), local Mexican suppliers only produce indirect materials, they do not produce direct items. Foreign suppliers, however, made several direct items. There are several reasons why the IMMEX has not developed a strong network of local suppliers, but mainly because the plants to be installed in Mexico already had local suppliers in their own territory and who have already established a relationship of trust regarding the quality and delivery time.

2. Literature Review

Albert O. Hirschman (1981) stated, for the first time in 1958, the theory of the forward links and backwards, which constitute a sequence of investment decisions that take place during the process of industrialization that characterizes economic development. The backward links are represented by investment decisions and cooperation aimed at strengthening the production of raw materials and the goods needed for the production of finished products to happen. Meanwhile, forward links involve the incorporation of new technology and research and development to improve or create new products.

The types of chain may be a developing product, raw materials, secondary goods, infrastructure, human capital, manufacturing and logistics. Aoso Kaldor proposed a new theory, from which the model of Kaldor's explanation about the rise of capital is apparent. Kaldor's model (1956) is a thorough explanation of the theoretical possibility of a capitalism that can grow steadily and predict cyclical movements. We believe it can improve the income distribution (Zermeño, 2004, p.80).

In literature, ideas about Kaldor were found on other of the topics mentioned as important division in terms of economic activity from which the following statements emerge: a) only uses of natural resources such as land (under the assumption of diminishing returns) and; b) the industrial or processing activity (under the assumption of increasing returns). It is believed that both types of productive type activities (excluding in principle the services sector) exist in both economic regions depend on international trades so they can meet their requirements. However, "the growth rates of industrial activities, will determine the growth of a country or region" (Calderon and Martinez, 2005, p. 5).

The description of the first Kaldor Act establishes a positive relationship between the growth rate of an economy and its manufacturing sector, which means that the latter is the engine of growth. The explanation for this link is associated with high multiplier effect in the industrial sector due to high income elasticities of demand for manufactured goods; the strong production chains back and forth from industrial activities, and learning economies can be obtained with the division of labor and specialization progresses as a result of industry activities. Kaldor says that the rate of economic growth is associated with the growth rate of the manufacturing sector of the economy, which is considered a feature of the transition from immaturity to maturity, where the former is defined as a situation in which productivity is low compared with the industry, so the work is available for use in industry in relatively unlimited quantities (Thirlwall, 1983, p. 345).

Taiwan supply model: The development of suppliers in the electronics sector is aligned to the needs imposed by international challenging; the basic factor of success is its local supply base. We conclude that the gradual learning process and accumulation technological capabilities Taiwan has, they have facilitated the transition of manufacturing simple products to more complex processes.

Malaysia supply model: The local supply is characterized by the development of capabilities to meet standards of quality, cost and timelines required by transnational companies, establishing flexible production systems as well as training programs and defending the creation of new companies within existing ones, which act as incubators (Ariffin, 2000).

Singapore supply model: The importance of the electronics industry accounts for 40% of the value of production and exports, however, the participation of the local supply is minimal, since the chains of transnational corporations were primarily associated with other transnational companies in the region. Education policies and technical training for work have led to industrialization, however a local base of enterprises around the large transnational companies was founded. For more than three decades there was no policy for the development of SMEs, favoring large foreign companies against local small ones. Some local companies could provide support engineering to develop its own brands, making hard drives, chips, printed circuit boards and computers (Torres, 2007).

Japan supply model: Wants to propose a subcontract or vertical integration of other large companies with small or medium size. Plus, the integrator policy can offer a product that is designed and developed under certain technical specifications for several small companies, each of which performs one or more modules and then are integrated into a single final product. If the provider meets the requirements of quality and delivery times, the relationship should be lasting. The supplier development programs are efficient because the suppliers who have trouble meeting the specifications, usually send teams to improve productivity in companies owned by their suppliers (Gonzalez, 2000).

Italian supply model: It proposes to create horizontal business networks. The horizontal way differs from the nets, they are a form of cooperation and competition between companies that are located in distinct and consecutive positions in the production chain, and are associated for competitive advantage they couldn't achieve individually (Dominguez, 1996). Suppliers in value chains approach the market analyzing the value chain, meaning "all activities of a production process from design or product conception to delivery to the final consumer." (Porter, 1999).

Generally, the literature emphasizes these links across borders between productive enterprises and distribution systems, which allows to see the entire cycle (product design-receipt by the final consumer) as a process of continuous interaction and add value. The suppliers are connected with the industry that provides its principal office, corresponding those activities within the core of the chain.

3. Supplying in Sonora

During the research on the local supply state, we found that there are obstacles that limit their development. In the bullet points, we will present the characteristics of Mexican local suppliers, as well as the main obstacles they face to break into the IMMEX, according to a research conducted by different scholars in the subject (Arias and Solari, 2008; Bracamonte and Contreras, 2008; Carrillo, 2002 and 2003; Contreras, 2000; Mungaray and Benitez, 2000; Ollivier, 2007; Zárate, 2003).

Based on the 20 surveys that were applied to managers responsible for purchases in the industry, the following aspects were found:

- Most of all that input is reached out to the supplying companies that carry the industry and work with foreign firms, and only about 6% of them work with the Mexican industry.
- 6% of the inputs are purchased from the local industry, 3% are indirect, such as office suppliers and cleaning suppliers.
- In order to be an IMMEX provider, certain criteria must be achieved, such as:
 - a) Certification: must have a certification, which is granted by the ultimate purchaser.
 - b) Quality: requires to meet certain quality standards in their inputs, as this is what companies take into account analyzing the direct impact on production costs.
 - c) Price: in this department, 50% seek competitive prices.
 - d) Ability to manage inventory: all IMMEX flexibility requires its suppliers to deliver on time according to their abilities and depending on whatever the final order may be.
 - e) Good service: it must be reliable in delivery times, quality and flexibility.
 - f) Technological capacity: as to this department, they should ask their suppliers for innovation capacities, production and continuous improvements.

3.1. Government's Support of IMMEX in Sonora

In the survey applied to managers of companies involved with IMMEX, they wondered if they ever received government support. Their response was somewhat varied, as some said no, they had never received any support or the federal government. Also, some companies responded that they had received support, consisting of employee training programs, and have also received support from 'Bécalos', the latter support has helped many employees mainly giving them the opportunity to continue studying thanks to the support provided by the Federal Government. They have also joined IMMEX programs such as CONACYT and Federal Ministry of Economics.

3.2. Study Methodology

The methodology used in this research is strictly descriptive and documentary. To carry out and develop the topics discussed above we rely on bibliographical sources, which are: newspapers, official country statistics and theses. According to Alfonso (1995), documentary research, is a scientific method, a systematic process of investigation, collection, organization, analysis and interpretation of information or data about a given topic and in-depth interviews.

4. Conclusion

With this analysis, we can be aware of the situation in our state in terms of the IMMEX program and we can draw some conclusions related to the problems that are limiting the suppliers in Sonora.

We think that in order to be a supplier of inputs for companies with the IMMEX program, you must go through a series of challenges, which are very important regarding quality, delivery compliance, capacity technologies. However, there is a big problem, that the state's producers do not have support and that many inputs are consumed in the same state. In connection with the development of suppliers, they are not interested in providing technological capability, however, they have supported the information about future demand requirements, conventions that are related to indirect inputs such as packaging material, labels and cleaning materials.

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Human Resource Management's Marketing Approach and Its Contribution Towards Employee-Satisfaction

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In times when organizations in Germany are confronted with a constant change-dynamic regarding their working conditions managers understand that human resources are an important driving factor for the overall company's performance. The attractiveness of an organization towards potential and actual employees is therefore an issue which is of broad interest for general management as it plays an increasing role to reach company's aims. Necessary for creating such an attractiveness as employer are the establishment of substantiated processes of acquiring and retaining employees. The objective of this paper is to assess whether the application of a company's human resource management's marketing approach has an impact on employee satisfaction. Concerning the research methods causal modelling and triangulation of research are used. Quantitative research is applied. Results show that the better a company's human resource management's marketing approach in terms of its quality and performance is, the higher is the employees' perception about their employer's organization as well as the overall employees' satisfaction. Findings also reveal a significant positive relationship between a high quality of human resource management's marketing approach and employee satisfaction. Furthermore, a positive relation between a high performance of human resource management's marketing approach and the classification of a company's brand awareness on the labor market as well as a company's classification into an employer of choice is found. Thus, it can be concluded that human resource management's marketing approach is a viable process in the realm of human resource management to steer a company's success through a focus on employee satisfaction.

Keywords: Human resource management, employee satisfaction, human resource management's marketing approach

JEL Classification: M51 - Firm Employment Decisions; Promotions

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Article History:
Received 20 November 2015 | Accepted 30 November 2015 | Available Online 1 December 2015

Cite Reference:
Minder, S., and Balina, S., 2015. Human Resource Management's Marketing Approach and Its Contribution Towards Employee-Satisfaction. Expert Journal of Business and Management, 3(2), pp.194-204

1. Introduction

The economic task of human resource management is to ensure the most favorable supply and maintenance of adequately capable and performance-oriented personnel in companies. If this task is completed, the principal relationship of the company towards its organization and its productive forces is fundamentally fulfilled. In this context the relevance of the concept of human resource management as a trigger of positive contributions to the company's success is increasing. The pursuit of effectiveness and efficiency committed to the company's success requires of human resources management an approach which takes into account not only the business conditions but especially the needs of a target group that needs to be acquired and retained by the organization.

The identification and recruiting of this target group orientates itself on the needs of the actual and potential employees of a company and their demands towards an employer. The same applies for retaining employees. By a successful acquiring and retaining of employees human resource management contributes significantly to improving company's performance. Human resource management's marketing (HRMM) approach – as one subsystem of human resource management - is hereby the function organizations need to focus on. It forms the bases for a successful acquiring and retaining of employees by attractively positioning a company on the labor market as well as significantly driving employee satisfaction within a company.

2. Theoretical background of the research

The idea of a HRMM approach that focusses on an increasing employee satisfaction is not completely new. Different authors made an effort to establish and develop different concepts of such HRMM approaches (Bleis, 1992, p. 10f; Dietmann, 1993, p. 108f.; Staffelbach, 1995, p. 144; Bartscher & Fritsch, 1992, p. 1747f.; Fröhlich, 2004, p. 17f.). Nevertheless, the environment of organizations is changing fast and the development on the labor market – as one of the driving forces for the establishment of an employee satisfying HRMM approach as a sub-function in the area of human resource management - is very fast, too, especially in times of fast changing economic challenges as they appear today. This gives way to an actual consideration of the topic of HRMM as empirical approaches from ten to twenty years earlier are not adequate anymore.

In addition - caused for example by the demographic change – a situation arises which leads to an augmented competition of organizations on the labor market for employees. Besides, the increasing demand for employees causes a higher risk for job changes of existing employees. Therefore the importance of HRMM approach raises. Existing employees need to be satisfied to ensure that they remain at the company and potential employees need to be attracted to the organizations and invited to apply. Therefore, on the one hand it is crucial for organizations to establish employee satisfying human resource management processes as employee satisfaction is vital for ensuring the long-term efficiency and effectiveness of organizations. On the other hand it is important for companies to position themselves successfully as a more attractive employer than their competitors.

As comparable organizations use – more or less – the same financial and material resources for their business but reach different performance levels in efficiency and effectiveness it becomes clear that the driving factor for these differences is in how company's management understands and implements its role in human resource management. Herein, the managerial influence on employee satisfaction is essential for a constant improvement of an organization's human resource management processes. Thus, the two aspects of employee satisfaction and a company's labor market attractiveness impact positively on a privileged supply of (potential) employees and ensure the business performance of a company (Koppel, 2008, p. 66f.).

2.1. Human resource management and the context to a HRMM approach

The economic task of human resource management is to ensure the most favorable supply and maintenance of adequately capable and performance-oriented personnel in companies (Bisani, 1995, pp. 51-79). If this task is completed, the principal relationship of the company towards its organization and its productive forces is fundamentally fulfilled. In this context the relevance of the concept of human resource management as a trigger of positive contributions to the company's success is increasing (Lado & Wilson, 1994, p. 699f.). The pursuit of effectiveness and efficiency committed to the company's success requires of human resources management an approach which takes into account not only the business conditions but especially the needs of a target group that needs to be acquired and retained by the organization. Marketing research provides - with regard to the exchange of scarce resources like employees on the labor market - fundamental insights and methods. For a conceptualization of human resource management in the context of

scarce resources the ideas of marketing management can therefore be used. Concepts and instruments of marketing support those core concerns of human resource management relating to obtaining and preserving resources in a bottleneck-embossed environment. The scarce resources on the labor market and at the company need to be targeted in a way that satisfies their needs and prolongs their stay in an organization as much as possible.

Human resource management is on the one hand used as a generic wording for every arrangement of personnel management. On the other hand it is seen as denotation of a specific approach within the human resource management which is identified by different characteristics (Boxall, 2008, p. 49). According to a narrow understanding companies try to gain competitive advantage by acquiring engaged and capable employees. For their acquisition a set of cultural, structural and personnel oriented techniques is used (Storey, 1995, p. 6f). For this approach the following three aspects are characteristic: Firstly, the reckoning of employees as important and competitive-relevant resource. Secondly, the integration of all human resource activities into the corporate strategy and thirdly, the integrative coordination of all human resource-related instruments.

The paper looks at a more generic understanding of human resource management. A conceptual clarification of the study object *human resource management* shows that there is broad agreement defining the subject area as all personnel economic actions within companies. More recent views broaden the concept even further. They transfer the concept to all human resource functional areas and aim at a strategic conformity. Oechsler (Oechsler, 2006, p. 353) understands human resource management as the totality of all personnel issues of design, control and development of a visionary and accordingly strategy oriented system.

Based on this, human resource management in the context of this work is defined as a system that copes with all themes related to the staff of an organization. Hence human resource management displays not only a conglomerate of single measures but a long-term strategy and is part of a complex interrelationship (Fröhlich, 2004, p. 24). By defining HRMM approach as a cross-divisional function of human resource management which influences main process functions of human resource management it is made obvious that HRMM approach is a sub-system of human resource management and not an independent discipline itself.

2.2. Employee satisfaction in the context of human resource management

Employees are the linchpin of functions and instruments of human resource management and its marketing approach. One of the key success indicators in this context is the satisfaction of employees (Homburg & Bucerius, 2008, p. 53f.). Spector (Spector, 2003, S. 57f.) states as definition of employee satisfaction with their employer that employee satisfaction is "the extent to which people like their job".

In the realm of human resource management employee satisfaction is related to two objectives. On the one hand employee satisfaction develops towards the work performance and the work content (work satisfaction). On the other hand satisfaction develops towards the employer organization itself. Definitions in literature focus mainly either on one or the other perspective (For an overview of definitions see Bauer et al., 2004, p. 23ff.). Due to the paper's focus on the HRMM approach of an organization and the organization's positioning on the labor market especially satisfaction with the employer organization is regarded.

This satisfaction with the employer organization is - analogous to Griffin (Griffin, 2010, p. 239f.) - the emotion of an employee towards its employer as a whole, not only towards the employee's job position within the company. In this context three major factors need to be considered to speak of employee satisfaction with the whole organization (Mowday, 1982, p. 83f.). Firstly, the employee needs to accept and support the company's overall objectives. Secondly, the employee is willing to excel in his or her daily business performance. And thirdly, the employee feels obliged to stay a member of the organization. These three factors can vary in their occurrence and specificity. However, what all factors have in common is that they bind the employee to an organization and lead to reach the overall company goals. This displays the task management - and especially human resource management - has to fulfill: to establish a mind-set within a company that determines employee satisfaction and the behavior leading to it.

3. Methods used in research

As science-theoretical basis for the empirical investigation the ideas of Carl Popper (Mayer, 2002, p. 15), the *Critical Rationalism*, are used. Causal models act as a rational reconstruction of the actual practice by applying the given theoretical framework (Mayer, 2002, p. 15). If an adequate correlation between the variables exists, the models argue for the plausibility of postulated relations. If it is inadequate, the tenability of such relations is rejected.

Besides the causal modelling also triangulation is used as research strategy. Hereby data sets of different sources are used within the empirical investigation to balance possible bias (Brown J. , 2001, p. 228). On the one hand company data - as one possible data source - are depicted, on the other hand data received from employees are used. Furthermore, different indicators are applied for describing the same construct (Todd, 1979, p. 603). Also here triangulation – within one research method - is applied.

An empirical investigation about HRMM approach and its influences on employee satisfaction needs to meet the requirements of a certain perspective. This perspective needs to express companies' views (self-assessment) as well as employees' view (assessment by others). In addition, it needs to reflect the theoretical framework about HRMM approach in practice.

With regard to the research objective a quantitative empirical research is conducted. Hereby the questioning was chosen as one possible research method (Schnell et al., 1999, p. 319) as a most broad comparability as well as a most possible structuring of the data sets can be reached (Mayring, 2003, p. 89). The questioning was documented via two different structured questionnaires. On the one hand companies have been questioned (self-assessment), on the other hand employees out of these organizations have been interviewed (assessment by others).

The development of both questionnaires has been closely linked to the conceptual part of the paper. Due to that integrative procedure a systematic linkage of the theoretical, conceptual basic principles with the empirical research is reached. The questionnaire for companies (self-assessment) consists of a brief introduction including the reason for the survey, target group, confirmation of anonymity, estimated handling time, contact details of participant and contact details of the author. The second part of the questionnaire consists of questions concerning the evaluation of the quality of a company's HRMM approach and questions concerning the evaluation of employee satisfaction. The whole questionnaire is standardized, no comments can be given.

The self-assessment questionnaire is filled in by companies – represented by human resource professionals. Human resource professionals have the insight and information concerning data of a company that illuminate the quality of its HRMM approach as well as employee satisfaction.

Human resource professionals in the context of the paper are defined as professionals working in human resource departments of organizations. Hereby no differentiation is made concerning their educational background or their individual tasks within the human resource department. The availability of these professionals is essential for an effective data collection. Therefore only those companies have been involved in the empirical research and analysed in-depth that were able to provide enough valid data. Valid data in this context mean enough contact persons to address as well as the utilization of their answers.

The second questionnaire (assessment by employees) substantiates the scientific aim with another set of quantitative data and is based on the same criteria concerning the linkage with the theoretical framework as mentioned above. It starts with a brief introduction including the same items as the organizations' questionnaire, followed by questions concerning the performance of HRMM approach and the employees' satisfaction with the employers' organizations.

To ensure a precise measurement of the hypothesis – both questionnaires considered details of a two-year period (2012 and 2013). All actions that have been taken into consideration outside that time period are not evaluated.

3.1. Research design of the empirical study

Following the definition of the research methodology and its science-theoretical basis is the definition of the whole research design. Hereby it is important to define which companies and employees participate in the empirical investigation and why they have been chosen. In addition, the conducting of the whole research process needs to be described to provide transparency into the executed process.

Before the description of the research's realization can be conducted it is - in a first step - crucial to describe the participants to establish a solid basis for the empirical investigation. The paper's object is the HRMM approach at companies. Hereby, a European or even worldwide investigation is economically not justifiable. As human resource management is – for the time being – nationally oriented a limitation to the area of Germany is conducted.

The necessity and priority of HRMM approach is increasing in times with restricted available labor demand. In this situation, companies make growing endeavours to acquire and retain employees. However, some organizations are more advanced in realizing these issues and put more focus on their HRMM approach than others (Steinle & Thies, 2008, p. 52). These organizations have understood that HRMM is one approach to face the problems of coping with limited labor demand and increasing labor supply. One possibility to

overcome this problem is the participation in career fairs (Nieschlag, & Hörschgen, 2002, p. 229). Therefore all companies participating in career fairs in Germany form the population for the empirical investigation. This population consists of 2328 companies.

A census is – due to economic reasons like time and costs – not applicable. Therefore a limitation of the investigation to some population's units takes place - a random sample is drawn. Out of a relevant database, which includes 56 different career fairs in Germany, four fairs have been randomly filtered. Hence, the sample size - as defined by the number of companies attending the four career fairs - is 482. At every fair companies were randomly selected to participate in the survey, so that in total 233 companies were asked to participate (master sample). However, 137 companies were not willing to respond at all and 68 companies stopped answering in the middle of the survey's process. Only 28 companies were finally willing to answer the whole questionnaire which leads to a response rate of 12.02 %. The low response rate is acknowledged and it is emphasized that the overall conclusions cannot be generalized due to the specifics of the research's target group. However, it is pointed out that the response rate for surveys that are conducted in Germany normally ranges between 10 – 20 % (Theurl & Saxe, 2009, p. 7). Even if the achieved response rate is at the lower edge of this range it represents reality concerning response rates in Germany. As the surveyed data is in most cases company confidential the companies' data sets have been made anonymous.

As already mentioned an assessment by others (employee survey) is conducted to provide a second data set on the research subject. Also here the random sampling is used. Randomly selected 336 employees of the 28 questioned companies have been asked to participate in the empirical investigation. The number of employees completing the whole questionnaire is 259, accounting for a response rate of 77.08%. Concerning this questionnaire also here the data sets are anonymous.

Different authors (Friedrichs, 1990, p. 245; Mayer, 2002, p. 97) point out the necessity that a chosen research method needs to be subjected to a pre-test, even if the author is personally present to clear ambiguities and to interact with the interview partners (Zikmund, 2003, p. 201). Against the background of the pre-test's importance both questionnaires have undergone a pre-test phase.

Following the pretest phase is the empirical research itself. For the data gathering career fairs have been personally attended between January and March 2014. The companies' questionnaires were distributed to the master sample of 233 companies. The organizations' representatives (human resource professionals) were personally invited to participate in the survey. In a second step, 336 employees out of these organizations were invited to participate in the survey. Also here the employees' questionnaire was personally distributed to the participants at the career fairs from January to March 2014.

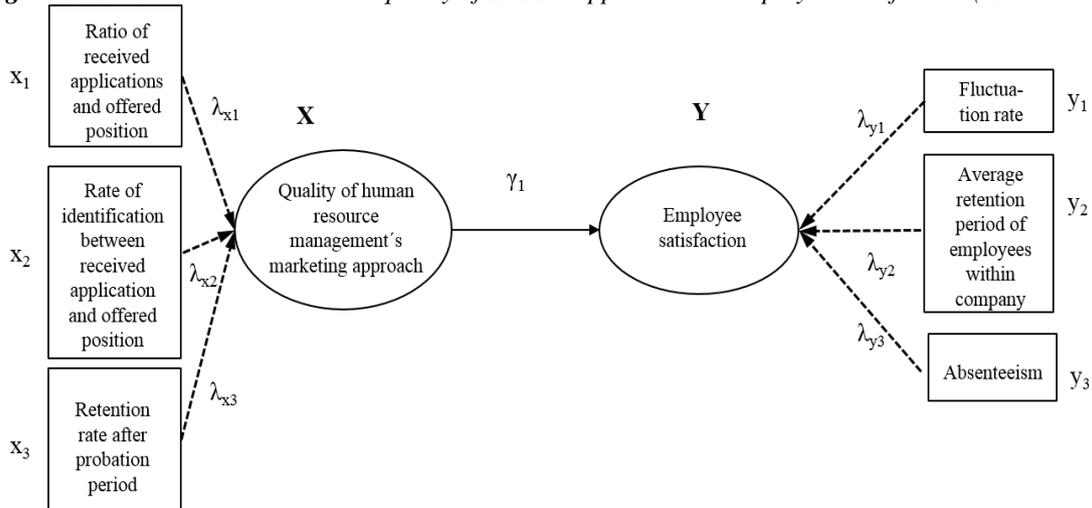
Limitation of this procedure is that only employees are interviewed who have been personally present at the career fairs. The method of how these employees have been chosen by their organizations to participate in the fairs is not evaluated. Therefore, this pre-selection can lead to results' bias. However, this possible pre-selection of probands is not of crucial importance for the aspired research aim which is to consider typical situations within organizations. The probands still fulfill the required relevance and applicability for the empirical investigation as their answers reflect typical situations within organizations.

The results of the surveys are evaluated by a statistical computer program (SPSS).

3.2. Modeling the relationship between HRMM approach and employee satisfaction

The purpose of the paper's theoretical framework is to provide a basis for probation in research and therefore for transformation into reality. The developed idea of the relationship between HRMM approach and employee satisfaction is such a basis which needs to be tested empirically. To circumstantiate this idea, the causal modelling is used and two causal models have been chosen to enable a bilateral evaluation of the impact of HRMM approach on employee satisfaction. The first model (see figure 1.) depicts the companies' view on the influence of HRMM approach on employee satisfaction. The second model (see figure 2.) substantiates this perspective with the employees' perception.

Figure 1. Causal model between the quality of HRMM approach and employee-satisfaction (Model no. 1)

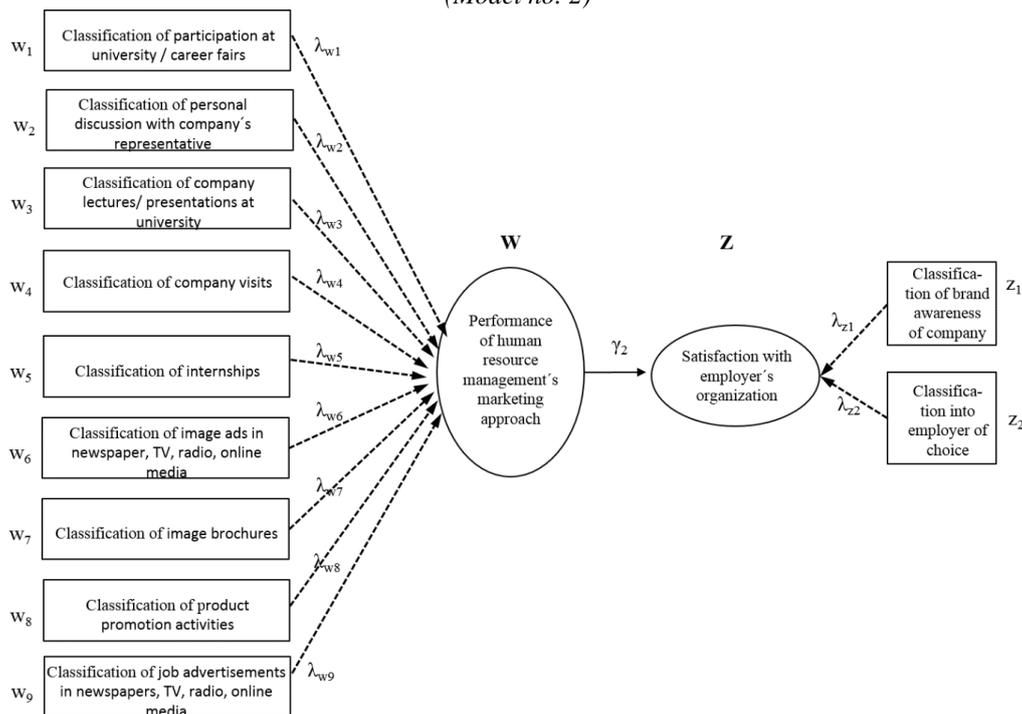


Source: Author's creation

The first model (see figure 1.) depicts a relationship between the independent structural variable *Quality of HRMM approach* (X) and the dependent structural variable *Employee satisfaction* (Y) - displayed via the arrow γ_1 . The independent structural variable *Quality of HRMM approach* (X) is described by the indicators *Ratio of received applications and offered positions* (x_1), *Rate of identification between received application and offered position* (x_2) and *Retention rate after probation period* (x_3). The arrows λ_{x1} , λ_{x2} , λ_{x3} display hereby the descriptions of the single indicators (x_1 , x_2 , x_3) for the structural variable *Quality of HRMM approach* (X). The dependent structural variable *Employee satisfaction* (Y) is described by the indicators *Fluctuation rate* (y_1), *Average retention period of employees within company* (y_2) and *Absenteeism* (y_3) - displayed via the arrows λ_{y1} , λ_{y2} , λ_{y3} .

In the second model (see figure 2.), the relationship between the independent structural variable *Performance of HRMM approach* (W) and the dependent structural variable *Satisfaction with employer organization* (Z) - displayed via the arrow γ_2 - is depicted.

Figure 2. Causal model between the performance of HRMM approach and satisfaction with employer organization (Model no. 2)



Source: Author's creation

As displayed in figure 2. the independent structural variable *Performance of HRMM approach (W)* is described by the nine indicators *Classification of participation at university / career fairs (w₁)*, *Classification of personal discussion with company's representatives (w₂)*, *Classification of company lectures / presentations at university (w₃)*, *Classification of company visits (w₄)*, *Classification of internships (w₅)*, *Classification of image advertisements in newspapers, TV, radio, online media (w₆)*, *Classification of image brochures (w₇)*, *Classification of product promotion activities (w₈)* and *Classification of job advertisements in newspapers, TV, radio, online media (w₉)*. The arrows λ_{w1} , λ_{w2} , λ_{w3} , λ_{w4} , λ_{w5} , λ_{w6} , λ_{w7} , λ_{w8} and λ_{w9} display hereby the descriptions of the single indicators (w₁, w₂, w₃, w₄, w₅, w₆, w₇, w₈, w₉) for the structural variable *Performance of HRMM approach (W)*. The dependent structural variable *Satisfaction with employer organization (Z)* is described by the indicators *Classification of brand awareness of company (z₁)* and *Classification into employer of choice (z₂)* - displayed via the arrows λ_{z1} and λ_{z2} .

Besides the structural variables and their indicators also a grouping variable exists which is not displayed in the two models. This grouping variable is called *Different employee groups* and might disclose differentiations in the empirical investigation. It represents different shareholders within an organization.

4. Main results' interpretation

In a first step, all indicators have been tested via the Shapiro-Wilk-Test. Hereby it is documented whether the indicators are normally distributed or not in order to decide for the usage of further statistical tests. The Shapiro-Wilk-Test test was run for all indicators. The result of the Shapiro-Wilk-Test shows that no normal distribution exists concerning all indicators. Therefore, all following statistical tests are run for non-normal distribution.

Secondly, the causal-models' constructs are assessed through correlation analysis (Spearman's Rho) to determine the strength and direction of relationship between the exogenous and endogenous variables. Hereby - as is suggested by Bauer (Bauer F., 1984, p. 167) - all correlations $r > 0.5$ are considered to be strongly related / strongly significant. Correlations between $r = 0.3$ and $r = 0.5$ are considered to be related / significant. All correlations $r < 0.3$ are considered to be not related / not significant.

Finally, an analysis of differences due to the grouping variable *Different employee groups* (Kruskal-Wallis Test) is conducted. In line with empirical convention an alpha level of 0.05 and confidence interval of 95.0 % are set to determine the significance of the statistical tests.

Of utmost interest is an investigation of correlations between the different variables' indicators to examine to which extend the postulated relations can be accepted. Correlation coefficients were calculated using the non-parametric test Spearman's Rho.

The results of correlation analyses indicate statistically significant relations between the postulated relationships.

An overview of the results of companies' assessment of Spearman's correlations' calculation is given in the following table 1. The algebraic sign of the correlation coefficient indicates the direction of association while the absolute value reveals its strength (Brosius, 2008, p. 527).

Table 1. Relationship between the quality of HRMM approach and employee satisfaction (Spearman's Rho) – derived from companies' assessment for the years 2012 and 2013

Indicators in 2012 / 2013	Fluctuation rate (y ₁)		Retention period (y ₂)		Absenteeism (y ₃)	
	2012	2013	2012	2013	2012	2013
<i>Ratio of received applications to offered positions (x₁)</i>	r = -0.97	r = -0.96	r = +0.96	r = +0.89	r = -0.47	r = -0.58
<i>Rate of identification between received application and offered position (x₂)</i>	r = -0.45	r = -0.50	r = +0.48	r = +0.50	r = -0.95	r = -0.84
<i>Retention rate after probation period (x₃)</i>	r = -0.78	r = -0.83	r = +0.76	r = +0.70	r = -0.32	r = -0.46

Note: All correlations are significant at the 0.01 level.

Source: Author's creation using research results

The highest relation ($r = -0.97$ in 2012 and $r = -0.96$ in 2013) exists between the *Ratio of received applications to offered positions (x₁)* and the *Fluctuation rate (y₁)* within a company. In addition, the *Retention*

period (y_2) of employees within an enterprise is also strongly related to the ratio of received applications to offered positions ($r = +0.96$ in 2012 and $r = +0.89$ in 2013). The more applications a company receives per offered position, the lower the fluctuation rate is and the higher the employee's retention period is within this organization. In addition a negative correlation – even if it is not as strong as the ones mentioned before - also exists between the ratio and absenteeism ($r = -0.47$ in 2012 and $r = -0.58$ in 2013). This means that the higher the ratio between received applications and offered position is, the lower is the number of absenteeism days within an organization. The lowest relation is between *Retention rate after probation period* (x_3) and *Absenteeism days* (y_3) within a company ($r = -0.32$ in 2012 and $r = -0.46$ in 2013). Even if this correlation is the lowest of the measured indicators it can be postulated that the higher the retention rate, the lower is the absenteeism within a company. The indicator *Rate of identification between received application and offered position* (x_2) has the subsequent lowest impact on the indicators describing the satisfaction of employees. For the relation between the rate of identification and the fluctuation rate the correlation coefficient is $r = -0.45$ in 2012 and $r = -0.50$ in 2013. For the relation with the retention period of existing employees within a company the coefficient is $r = +0.48$ in 2012 and $r = +0.50$ in 2013. The relation of the identification rate with the absenteeism is strongly negative ($r = -0.95$ in 2012 and $r = -0.84$ in 2013), indicating that a high rate of identification between application and offered position leads to lower absenteeism of employees. Concerning the retention rate of employees after their probation period and the fluctuation rate strong correlations exist ($r = -0.78$ in 2012 and $r = -0.83$ in 2013). The average retention period within a company increases with an increasing retention rate after the employees' probation period (correlation of $r = +0.76$ in 2012 and $r = +0.70$ in 2013).

The results show that companies certify themselves a profound understanding about the influence of their HRMM approach's quality on employee satisfaction. However, a second investigation is conducted to verify whether the companies adequately judge their HRMM approach's performance. Therefore, in the following, the postulated relations are also investigated by an assessment by others.

By looking at the results of Spearman's rank correlation coefficient the relations can also be approved via this second empirical research as employee satisfaction and HRMM approach was found to be related.

However, the correlation coefficients (see table 2.) display that an in-depth investigation of the single indicators' results must be conducted. It is obvious that employees more critically judge the issue of HRMM approach compared to their employers.

Table 2. Relationship between the performance of HRMM approach and employee satisfaction (Spearman's Rho) – derived from employees' assessment for the years 2012 and 2013

Indicators in 2012 / 2013	Classification of the company's brand awareness on the labor market (z_1)		Classification of the company into an employer of choice on the labor market (z_2)	
	2012	2013	2012	2013
<i>Classification of a company's participation at university and / or career fairs</i> (w_1)	$r = +0.70^{**}$	$r = +0.77^{**}$	$r = +0.57^{**}$	$r = +0.68^{**}$
<i>Classification of a personal discussion with a company's representative</i> (w_2)	$r = +0.46^{**}$	$r = +0.56^{**}$	$r = +0.39^{**}$	$r = +0.51^{**}$
<i>Classification of company lectures and / or presentations at university</i> (w_3)	$r = +0.46^{**}$	$r = +0.57^{**}$	$r = +0.49^{**}$	$r = +0.60^{**}$
<i>Classification of possible company visits</i> (w_4)	$r = +0.35^{**}$	$r = +0.48^{**}$	$r = +0.36^{**}$	$r = +0.49^{**}$
<i>Classification of internship offers within a company</i> (w_5)	$r = +0.42^{**}$	$r = +0.54^{**}$	$r = +0.43^{**}$	$r = +0.54^{**}$
<i>Classification of company's image advertisements in newspaper, TV, radio and / or online media</i> (w_6)	$r = +0.35^{**}$	$r = +0.345^{**}$	$r = +0.29^{**}$	$r = +0.39^{**}$
<i>Classification of company's image brochures</i> (w_7)	$r = +0.07$	$r = +0.21^{**}$	$r = +0.22^{**}$	$r = +0.35^{**}$
<i>Classification of company's product promotion activities</i> (w_8)	$r = -0.08$	$r = +0.03$	$r = +0.08$	$r = +0.16^*$

Classification of company's job advertisements in newspapers, TV, radio and / or online media (w₉)	r = +0.43**	r = +0.56**	r = +0.43**	r = +0.55**
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Note: ** Correlations are significant at the 0.01 level.

* Correlations are significant at the 0.05 level.

Source: Author's creation using research results

The correlations' results show that hardly any relation exists between the indicators *Classification of brand awareness of company* (z_1) and *Classification into employer of choice* (z_2) and the indicators *Image advertisements in newspaper, radio, TV and / or online media* (w_6) and *Image brochures* (w_7). The indicator *Product promotion activities* (w_8) is not at all significantly related to the indicator *Classification of brand awareness of company* (z_1) (correlation coefficient of $r = -0.08$ in 2012 and $r = +0.03$ in 2013) and therefore does not support that the higher the classification of a company's *Product promotion activities* is, the higher is the *Classification of this company's brand awareness*. In the year 2012 the algebraic sign for this relation was even negative. In the year 2013 the sign turned into positive. However, as the relation needs to be dismissed, this change in the algebraic sign does only play a minor role. Besides, also the relation that the higher the classification of a company's *Product promotion activities* is, the higher is the *Classification of the company into an employer of choice* (z_2) needs to be neglected. The correlation coefficient of $r = +0.08$ in the year 2012 and $r = +0.16$ in the year 2013 does not provide support for this relation. The indicator *Image brochures* (w_7) is not related to *Classification of brand awareness of company* (z_1) (correlation coefficient $r = +0.07$ in 2012 and $r = 0.21$ in 2013) and only slightly related to the indicator *Classification into employer of choice* (z_2) (correlation coefficient $r = +0.22$ in 2012 and $r = +0.35$ in 2013). Likewise, the indicator *Image advertisements in newspaper, TV, radios and / or online media* (w_6) is only slightly related to *Classification of brand awareness of company* (z_1) (correlation coefficient $r = +0.35$ in 2012 and $r = +0.45$ in 2013) and *Classification into employer of choice* (z_2) (correlation coefficient $r = +0.29$ in 2012 and $r = +0.39$ in 2013). All other indicators show a significant relation between 0.35 (correlation coefficient for *Company visits* (w_4) with *Classification of brand awareness of company* (z_1) in the year 2012) and 0.70 (correlation coefficient for *Participation at university / career fairs* (w_1) with *Classification of brand awareness of company* (z_1) in the year 2012).

Furthermore, HRMM approach needs to meet the requirements of the respective target group to be successful. Indicators can vary in their results due to this target-groups' differentiation. In the conducted research the target-groups were depicted by four different employee groups. Looking at an optionally target-group specific approach of HRMM approach the research shows that the indicators' results make a differentiation necessary in some cases. The Kruskal-Wallis Test was applied to contrast these perceived differences due to the grouping variable *Different employee groups*. In a first step, the research results of the companies' assessment are tested via the Kruskal-Wallis Test. Identified differences due to different investigated employee groups are depicted. Secondly, the test is ran for the employee's assessment to illustrate whether differences due to different employee groups arise in this investigation as well.

In the conducted Kruskal-Wallis Test of the companies' assessment all indicators' significance levels are $p = 0.000$. The confidence interval in the conducted Kruskal-Wallis Test is set at 95.00%; $p < 0.05$: statistically significant difference between the mean ratio of employee groups. As they are smaller than the predefined accepted significance level of $p = 0.050$, the Kruskal-Wallis Test argues for differences due to different employee groups. By additionally investigating the means of the indicators, these differences can be depicted.

To supply the research with another set of data, the Kruskal-Wallis Test is also conducted on the results of the employees' investigation. Possible differences due to the grouping variable *Different employee groups* are displayed and further investigated. The empirical research depicts differences due to the grouping variable in some indicators' results of the assessment by others. The significance level of the indicators *Classification of a company's participation at university and / or career fairs* (w_1) ($p = 0.021$), *Classification of a personnel discussion with a company's representative* (w_2) ($p = 0.021$), *Classification of a company's image brochure* (w_7) ($p = 0.000$) and *Classification of job advertisements in newspapers, TV, radio and / or online media* (w_9) ($p = 0.001$) as well as of *Classification of brand awareness of a company* (z_1) ($p = 0.049$) and *Classification of a company into an employer of choice* (z_2) ($p = 0.000$) are smaller than the predefined accepted significance level of $p = 0.050$ and therefore reflect significant differences due to the investigated employee groups.

5. Conclusions

The availability of labor forces is one of the basic premises for a company's economic success. In order to cope with this requirement in the future, the acquisition and retention of employees is of crucial importance. In the context of the paper human resource management and its marketing approach is displayed concerning its correlation with employee satisfaction. The following conclusions are the outcome of the work and starting points for further research.

- Overall, the postulated relations are proven for the time being. Organizations give themselves a positive testimonial concerning the quality of their HRMM approach. Employees judge this more critically. However, overall they state their employers a HRMM approach which satisfies their needs as well as demands and therefore contributes to their satisfaction.
- The quality of a company's HRMM approach is significantly contributing to the overall employee satisfaction. Furthermore, employees' perception of their employer's organization is significantly influenced by the performance of the HRMM approach of the employer's company.
- Differentiations concerning an organization's HRMM approach arise due to addressing different employee groups. Empirical evidence – derived from the Kruskal-Wallis Tests - shows that measures of HRMM approach need to be adapted to the target-groups' differing demands on the labor market.
- Spearman's Rho displayed that different instruments of a company concerning its HRMM approach have a different impact on employee satisfaction. However, there is still room for further investigation. The reasons why three instruments are not regarded as essential for a labor market-oriented and employee satisfying approach should be deeper investigated. This could help to develop a prioritization in the ranking of the different instruments to enhance the companies' performance concerning their HRMM approach.
- The work only conducted quantitative investigations. Further research should be applied considering qualitative measures. Qualitative analysis can try to substantiate the already gained deeper insight as the paper provides first explanations for employees' satisfying structures of human resource management and its results concerning personnel.

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Linear and Non-Linear Regression: Powerful and Very Important Forecasting Methods

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Regression Analysis is at the center of almost every Forecasting technique, yet few people are comfortable with the Regression methodology. We hope to improve the level of comfort with this article. In this article we briefly discuss the theory behind the methodology and then outline a step-by-step procedure, which will allow almost everyone to construct a Regression Forecasting function for both the linear and some non-linear cases. Also discussed, in addition to the model construction mentioned above, is model testing (to establish significance) and the procedure by which the Final Regression equation is derived and retained to be used as the Forecasting equation. Hand solutions are derived for some small-sample problems (for both the linear and non-linear cases) and their solutions are compared to the MINITAB-derived solutions to establish confidence in the statistical tool, which can be used exclusively for larger problems.

Keywords: Linear Regression, Non-Linear Regression, Best-Fitting Model, Forecasting

JEL Classification: M10

1. Introduction and Model Estimation for the Linear Model

Regression analysis, in which an equation is derived that connects the value of one dependent variable (Y) to the values of one independent variable X (linear model and some non-linear models), starts with a given bivariate data set and uses the Least Squares Method to assign the best possible values to the unknown multipliers found in the models we wish to estimate. The bivariate data, used to estimate the linear model and some non-linear models, consists of n ordered pairs of values:

$$(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$$

The linear model we wish to estimate, using the given data, is:

$$y = a + bx \tag{1}$$

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Article History:

Received 2 November 2015 | Accepted 23 November 2015 | Available Online 19 December 2015

Cite Reference:

Vasilopoulos, A., 2015. Linear and Non-Linear Regression: Powerful and Very Important Forecasting Methods. *Expert Journal of Business and Management*, 3(2), pp.205-228

while the non-linear models of interest are given by

$$y = ke^{cx} \text{ (Exponential Model)} \quad (2)$$

$$y = ax^b \text{ (Power Model)} \quad (3)$$

and

$$y = a + bx + cx^2 \text{ (Quadratic Model)} \quad (4)$$

To estimate model (1) we use the Least Squares Methodology, which calls for the formation of the quadratic function:

$$Q(a, b) = \sum_{i=1}^n [y_{\text{actual}} - y_{\text{linearequation}}]^2 = \sum_{i=1}^n y_i^2 - 2a \sum_{i=1}^n y_i - 2b \sum_{i=1}^n x_i y_i + 2ab \sum_{i=1}^n x_i + b^2 \sum_{i=1}^n x_i^2 \quad (5)$$

To derive the “normal” equations for the linear model from which the values of **a** and **b** of the linear model are obtained, we take the partial derivative of Q(a,b) of equation (5) with respect to a and b, set each equal to zero, and then simplify:

The result is:

$$\frac{\partial Q(a, b)}{\partial a} = -2 \sum_{i=1}^n y_i + 2b \sum_{i=1}^n x_i + 2an \quad (6)$$

and

$$\frac{\partial Q(a, b)}{\partial b} = -2 \sum_{i=1}^n x_i y_i + 2a \sum_{i=1}^n x_i + 2b \sum_{i=1}^n x_i^2 \quad (7)$$

When (6) and (7) are set equal to zero and simplified, we obtain the “Normal” equations for the linear model:

$$na + b \sum_{i=1}^n x_i = \sum_{i=1}^n y_i \quad (8)$$

$$a \sum_{i=1}^n x_i + b \sum_{i=1}^n x_i^2 = \sum_{i=1}^n x_i y_i \quad (9)$$

The only unknowns in equation (8) and (9) are **a** and **b** and they should be solved for them simultaneously, thus deriving (or estimating) the linear model. This is so because all the other values of equations (8) and (9) come from the given data, where:

n = number of ordered pairs (x_i, y_i)

$$\sum_{i=1}^n x_i = x_1 + x_2 + \dots + x_n = \text{sum of the x values}$$

$$\sum_{i=1}^n y_i = y_1 + y_2 + \dots + y_n = \text{sum of the y values}$$

$$\sum_{i=1}^n x_i^2 = x_1^2 + x_2^2 + \dots + x_n^2 = \text{sum of the given x values, which are first squared}$$

$$\sum_{i=1}^n x_i y_i = x_1 y_1 + x_2 y_2 + \dots + x_n y_n = \text{sum of the products of the } x_i \text{ and } y_i \text{ values in each ordered pair.}$$

Note: The values of (a) and (b) obtained from the Normal equations correspond to a minimum value for the Quadratic function Q(a,b) given by equation (5), as can be easily demonstrated by using the

Optimization methodology of Differential Calculus for functions of 2 independent variables.

To complete the Estimation of the Linear model we need to find the standard deviation for a, $\sigma(a)$, and b, $\sigma(b)$, which are needed for testing of the significance of the model. The standard deviations, $\sigma(a)$, and $\sigma(b)$, are given by:

$$\sigma(a) = \frac{\hat{\sigma}}{\sqrt{n}} \left[\frac{\sum_{i=1}^n x_i^2}{\sum_{i=1}^n (x_i - \bar{x})^2} \right]^{1/2} = \frac{\hat{\sigma}}{\sqrt{n}} \left[\frac{\sum_{i=1}^n x_i^2}{\sum_{i=1}^n x_i^2 - \frac{\left(\sum_{i=1}^n x_i\right)^2}{n}} \right]^{1/2} \quad (10)$$

and

$$\sigma(b) = \frac{\hat{\sigma}}{\left[\sum_{i=1}^n (x_i - \bar{x})^2 \right]^{1/2}}, \quad (11)$$

where:

$$\hat{\sigma} = \left[\frac{\sum_{i=1}^n y_i^2 - a \sum_{i=1}^n y_i - b \sum_{i=1}^n x_i y_i}{n - 2} \right]^{1/2} \quad (12)$$

The **a** and **b** in equation (12) come from the solution of equations (8) and (9) while $\sum_{i=1}^n y_i^2$, $\sum_{i=1}^n y_i$, and $\sum_{i=1}^n x_i y_i$ come directly from the given bivariate data.

2. Model Testing

Now that our model of interest has been estimated, we need to test for the significance of the terms found in the estimated model. This is very important because the results of this testing will determine the final equation which will be retained and used for Forecasting purposes.

Testing of the linear model consists of the following steps:

2.1. Testing for the significance of each term separately

Here we test the hypotheses:

1. $H_0: \beta = 0$ vs $H_1: \beta \neq 0$, and
2. $H_0: \alpha = 0$ vs $H_1: \alpha \neq 0$, based on our knowledge of b, $\sigma(b)$, a, and $\sigma(a)$.

If $n \geq 30$, we calculate

$$Z_b^* = \frac{b}{\sigma(b)}$$

and

$$Z_a^* = \frac{a}{\sigma(a)}$$

and compare each to $Z_{\alpha/2}$ (where $Z_{\alpha/2}$ is a value obtained from the standard Normal Table when α , or $1 - \alpha$, is specified).

For example if $\alpha = 0.05$, $Z_{\alpha/2} = Z_{0.025} = 1.96$; if $\alpha = 0.10$, $Z_{\alpha/2} = Z_{0.05} = 1.645$; if $\alpha = 0.02$, $Z_{\alpha/2} = Z_{0.01} = 2.33$ and if $\alpha = 0.01$, $Z_{\alpha/2} = Z_{0.005} = 2.58$).

If $Z_b^* > Z_{\alpha/2}$ (or $Z_b^* < -Z_{\alpha/2}$), the hypothesis $H_0: \beta = 0$ is rejected and we conclude that $\beta \neq 0$ and the term \mathbf{bx} (in the estimated model $\hat{y} = a + \mathbf{bx}$) is important for the calculation of the value of y . Similarly, if $Z_a^* > Z_{\alpha/2}$ (or $Z_a^* < -Z_{\alpha/2}$), $H_0: \alpha = 0$ is rejected, and we conclude that the linear equation $\hat{y} = a + \mathbf{bx}$ does not go through the origin.

If $n < 30$, we calculate

$$t_b^* = \frac{b}{\sigma(b)}$$

and

$$t_a^* = \frac{a}{\sigma(a)}$$

and compare each to $t_{n-2(\alpha/2)}$, for a given α value, where $t_{n-2(\alpha/2)}$ is obtained from the t-distribution table, with the same interpretation for $H_0: \beta = 0$ and $H_0: \alpha = 0$ as above.

But, instead of hypothesis testing, we can construct Confidence Intervals for β and α using the equations:

$$P[b - Z_{\alpha/2}\sigma(b) \leq \beta \leq b + Z_{\alpha/2}\sigma(b)] = 1 - \alpha \quad (13)$$

and, if $n \geq 30$,

$$P[a - Z_{\alpha/2}\sigma(a) \leq \alpha \leq a + Z_{\alpha/2}\sigma(a)] = 1 - \alpha \quad (14)$$

or

$$P[b - t_{n-2(\alpha/2)}\sigma(b) \leq \beta \leq b + t_{n-2(\alpha/2)}\sigma(b)] = 1 - \alpha \quad (15)$$

and, if $n < 30$,

$$P[a - t_{n-2(\alpha/2)}\sigma(a) \leq \alpha \leq a + t_{n-2(\alpha/2)}\sigma(a)] = 1 - \alpha \quad (16)$$

If the hypothesized values: $\beta = 0$ falls inside the Confidence Intervals given by equations (13) or (15), or $\alpha = 0$ falls inside the Confidence Intervals given by equations (14) or (16), the corresponding hypotheses $H_0: \beta = 0$ and $H_0: \alpha = 0$ are not rejected and we conclude that $\beta = 0$ (and $b = 0$ and the term \mathbf{bx} is not important for the calculation of y) and $\alpha = 0$ (i.e. $a = 0$ and the line goes through zero). If for a given data set, we performed the above-discussed tests, we will obtain one of 4 possible conclusions:

A) $H_0: \beta = 0$ and $H_0: \alpha = 0$ are both rejected; Therefore $\beta \neq 0$, and $\alpha \neq 0$, and both the terms \mathbf{a} and \mathbf{bx} are important to the calculation of y . In this case the final equation is $\hat{y} = a + \mathbf{bx}$, with both terms staying in the equation.

B) $H_0: \beta = 0$ is rejected, but $H_0: \alpha = 0$ is not rejected. Therefore $\beta \neq 0$ but $\alpha = 0$ and the term \mathbf{a} is not important to the calculation of y . In this case the final equation is $\hat{y} = \mathbf{bx}$, with the term \mathbf{a} dropping out of the equation.

C) $H_0: \beta = 0$ is not rejected but $H_0: \alpha = 0$ is rejected. Therefore $\beta = 0$ and the term \mathbf{bx} is not important for the calculation of y , while $a \neq 0$ and is important to the calculation of y . In this case the final equation is $\hat{y} = a$, with the term \mathbf{bx} dropping out of the equation

D) $H_0: \beta = 0$ and $H_0: \alpha = 0$ are both not rejected; Therefore $\beta = 0$, and $\alpha = 0$, and both terms \mathbf{a} and \mathbf{bx} are not important to the calculation of y . In this case the final equation will be $\hat{y} = 0$, with both terms \mathbf{a} and \mathbf{bx} dropping out of the equation.

2.2. Testing for the Significance of the Entire Linear Equation

This test consists of testing the hypothesis:

1. $H_0: \alpha = \beta = 0$ vs $H_0: \alpha$ and β are not both equal to 0, or
2. H_0 : The Entire Regression equation is not significant vs H_1 : The Entire Regression equation is significant

For a given bivariate data set and a given α value, we need to first calculate:

$$\text{Total Sum of Squares} = \sum_{i=1}^n (y_i - \bar{y})^2 = \sum_{i=1}^n y_i^2 - \frac{\left(\sum_{i=1}^n y_i\right)^2}{n} \quad (17)$$

$$\text{Regression Sum of Squares} = \text{RSS}_b = \sum_{i=1}^n (\hat{y}_i - \bar{y})^2 = b^2 \sum_{i=1}^n (x_i - \bar{x})^2 = b^2 \left[\sum_{i=1}^n x_i^2 - \frac{\left(\sum_{i=1}^n x_i\right)^2}{n} \right] \quad (18)$$

$$\text{Error Sum of Squares} = \text{ESS} = \sum_{i=1}^n (y_i - \hat{y}_i)^2 = Q^* = \sum_{i=1}^n y_i^2 - a \sum_{i=1}^n y_i - b \sum_{i=1}^n x_i y_i \quad (19)$$

$$\text{Sum of Squares Due to the Constant} = \text{SS}_a = \frac{\left(\sum_{i=1}^n y_i\right)^2}{n} \quad (20)$$

Then we calculate:

$$F_{Total}^* = \frac{(\text{RSS}_b + \text{SS}_a) / 2}{\text{ESS} / n - 2} \quad (21)$$

and compare F_{Total}^* to $F_{n-2}^2(\alpha)$, which is a tabulated value, for a specified α value. If $F_{Total}^* > F_{n-2}^2(\alpha)$, we reject H_0 and conclude that the entire regression equation (i.e. $\hat{y}=a+bx$) or that both the constant term **a**, and the factor x (and term **bx**) are significant to the calculation of the y value, simultaneously.

Note 1:

When TSS, RSS_b , and ESS are known, we can also define the coefficient of determination R^2 , where:

$$R^2 = \frac{\text{RSS}_b}{\text{TSS}} = 1 - \frac{\text{ESS}}{\text{TSS}} \quad (22)$$

where $0 \leq R^2 \leq 1$, which tells us how well the regression equation $\hat{y} = a + bx$ fits the given bivariate data. A value of R close to 1 implies a good fit.

Note 2:

$$r = \text{correlation coefficient} = \sqrt{R^2} \quad (23)$$

2.3. A Bivariate Example

A sample of 5 adult men for whom heights and weights are measured gives the following results (Table 1):

Table 1. Given bivariate data set (n =5)

x = H	y = W	x²=H²	y²=W²	xy = HW
64	130	64 ²	130 ²	64 x 130
65	145	65 ²	145 ²	65 x 145
66	150	66 ²	150 ²	66 x 150
67	165	67 ²	165 ²	67 x 165
68	170	68 ²	170 ²	68 x 170

For this Bivariate Data set we have: $n = 5$

$$\sum_{i=1}^5 x_i = 64 + 65 + 66 + 67 + 68 = 330$$

$$\sum_{i=1}^5 x_i^2 = 64^2 + 65^2 + 66^2 + 67^2 + 68^2 = 21,790$$

$$\sum_{i=1}^5 y_i = 130 + 145 + 150 + 165 + 170 = 760$$

$$\sum_{i=1}^5 y_i^2 = 130^2 + 145^2 + 150^2 + 165^2 + 170^2 = 116,550$$

$$\sum_{i=1}^5 x_i y_i = (64 \times 130) + (65 \times 145) + (66 \times 150) + (67 \times 165) + (68 \times 170) = 50,260$$

$$\sum_{i=1}^5 x_i, \quad \sum_{i=1}^5 x_i^2, \quad \sum_{i=1}^5 x_i y_i$$

To obtain the linear equation $\hat{y} = a + bx$, we substitute the values of n ,
to equations (8) and (9) and obtain:

$$\begin{cases} 5a + 330b = 760 \\ 330a + 21,790b = 50,260 \end{cases}$$

When these equations are solved simultaneously we obtain: $a = -508$ and $b = 10$, and the regression equation is

$$\hat{y} = a + bx = -508 + 10x.$$

$$\sum_{i=1}^5 y_i, \quad \sum_{i=1}^5 y_i^2, \quad \sum_{i=1}^5 x_i y_i$$

Then, using the values of $a = -508$, $b=10$, and $\sum_{i=1}^5 y_i$, $\sum_{i=1}^5 y_i^2$ and $\sum_{i=1}^5 x_i y_i$ we obtain from equation (12):

$$\hat{\sigma} = \left[\frac{116,550 - (-508)(760) - (10)(50,260)}{5 - 2} \right]^{1/2} = \left[\frac{30}{3} \right]^{1/2} = \sqrt{10} = 3.16228$$

and from equations (10) and (11):

$$\sigma(a) = \frac{\sqrt{10}}{\sqrt{5}} \left[\frac{21,790}{21,790 - \frac{(330)^2}{5}} \right]^{1/2} = \sqrt{2} \left[\frac{21,790}{10} \right]^{1/2} = \left[\frac{2 \times 21,790}{10} \right]^{1/2} = \sqrt{4358} = 66.015$$

$$\sigma(b) = \frac{\sqrt{10}}{\left[21,790 - \frac{(330)^2}{5} \right]^{1/2}} = \frac{\sqrt{10}}{[10]^{1/2}} = \frac{\sqrt{10}}{\sqrt{10}} = 1$$

Since $n=5 < 30$, \mathbf{a} and \mathbf{b} are distributed as $t_{n-2} = t_3$ variables and when $\alpha = 0.05$, $t_3(\alpha/2) = t_3(0.025) = \pm 3.1824$.

Then the hypotheses $H_0: \beta = 0$ vs. $H_1: \beta \neq 0$, and $H_0: \alpha = 0$ vs. $H_0: \alpha \neq 0$ are both rejected because:

$$t_a^* = \frac{a}{\sigma(a)} = \frac{-508}{66,015} = -7.695 < -3.1824$$

and

$$t_b^* = \frac{b}{\sigma(b)} = \frac{10}{1} = 10 > 3.1824$$

Therefore, the final equation is

$$\hat{y} = a + bx = -508 + 10x.$$

To test for the significance of the entire equation, and to calculate the coefficient of determination, we first evaluate, TSS, RSS_b , ESS, SS_a using equations (17) – (20) and obtain:

$$TSS = 116,550 - \frac{(760)^2}{5} = 1030$$

$$RSS_b = 10^2 \left[21,790 - \frac{(330)^2}{5} \right] = 10^2 (10) = 1000$$

$$ESS = 116,550 - (-508)(760) - 10(50,260) = 30$$

$$SS_a = \frac{(760)^2}{5} = 115,520$$

From equation (22), we obtain $R^2 = 1000/1030 \approx 0.971$, which tells us that 97% of the variation in the values of Y can be explained (or are accounted for) by the variable X included in the regression equation and only 3% is due to other factors. Since R^2 is close to 1, the fit of the equation to the data is very good.

Note:

The correlation coefficient r, which measures the strength of the linear relationship between Y and X is related to the coefficient of determination by:

$$r = \sqrt{R^2} = \sqrt{0.97} = 0.985$$

for this example. Clearly X and Y are very strongly linearly related.

Using equation (21) we obtain:

$$F_{Total}^* = \frac{(RSS_b + SS_a) / 2}{ESS / n - 2} = \frac{(1000 + 115,520) / 2}{30 / 3} = \frac{58,260}{10} = 5,826$$

when F_{Total}^* is compared to

$$F_{n-2}^2(\alpha) = F_3^2(\alpha) = \begin{cases} 10.13 & \text{if } \alpha = 0.05 \\ 34.12 & \text{if } \alpha = 0.01 \end{cases}$$

H_0 (The entire regression equation is not significant) is rejected, and we conclude that the entire regression equation is significant.

3. MINITAB Solution to the Linear Regression Problem

We enter the given data and issue the regression command as shown in Table 2.

Table 2. Data set in MINITAB

MTB > Set C1
DATA> 64 65 66 67 68
DATA> end
MTB > set C2
DATA> 130 145 150 165 170
DATA> end
MTB > Name C1 'X' C2 'Y'
MTB > REGRESS 'Y' 1 'X'

and obtain the MINITAB output presented in Table 3, Table 4, and Figure 1.

Table 3. Regression Analysis: Y versus X

Regression equation:		Y = - 508 + 10.0 X			
Predictor	Coef	SE Coef	T	p	
Constant	-508.000	66.020	-7.700	0.005	
X	10.000	1.000	10.000	0.002	
Regression fit:	S	R-Sq	R-Sq (adj)		
	3.162	97.1%	96.1%		
Analysis of Variance:					
Source	DF	SS	MS	F	p
Regression	1	1000.0	1000.0	100.0	0.002
Residual Error	3	30.0	10.0		
Total	4	1030.0			

Table 4. Correlations: Y, X

Pearson correlation of Y and X	0.985
P-Value	0.002

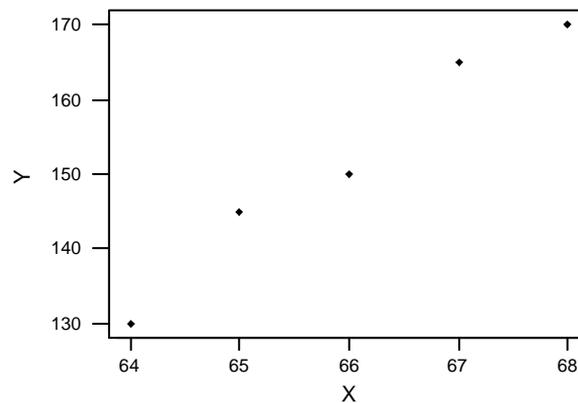


Figure 1. Plot Y * X

When we compare the MINITAB and hand solutions, they are identical. We obtain the same equation $\hat{y} = -508 + 10x$, the same standard deviations for **a** and **b** (under SE Coefficient) and the same t values, the same R^2 , the same $s = \sigma$ and $\sigma^2 = 10$. Notice also that an Analysis of Variance table provides the values for RSS_b , ESS , and TSS . The only value missing is SS_a , which can be easily calculated from

$$SS_a = \frac{\left(\sum_{i=1}^n y_i \right)^2}{n}$$

The MINITAB solution also gives a p-value for each coefficient. The p-value is called the “Observed Level of Significance” and represents the probability of obtaining a value more extreme than the value of the test statistic. For example the p-value for the predictor X is calculated as $p = 0.002$, and it is given by:

$$p\text{-value} = P(t > t^* = 10) = \int_{10}^{\infty} f(t) dt = 0.002 \tag{24}$$

The p-value has the following connection to the selected α -value.
If $p \geq \alpha$, do not reject H_0

If $p < \alpha$, reject H_0

Since $p = 0.002 < \alpha = 0.05$, $H_0: \beta = 0$ will be rejected.

4. Introduction and Model Estimation for Some Non-Linear Models of Interest

Sometimes two variables are related but their relationship is not linear and trying to fit a linear equation to a data set that is inherently non-linear will result in a bad-fit. But, because non-linear regression is, in general, much more difficult than linear regression, we explore in this part of the paper estimation methods that will allow us to fit non-linear equations to a data set by using the results of linear regression which is much easier to understand and analyze.

This becomes possible by first performing logarithmic transformations of the non-linear equations, which change the non-linear into linear equations, and then using the normal equations of the linear model to generate the normal equations of the “linearized” non-linear equations, from which the values of the unknown model parameters can be obtained. In this paper we show how the exponential model, $\hat{y} = ke^{cx}$, and the power model, $\hat{y} = ax^b$ (for $b \neq 1$) can be easily estimated by using logarithmic transformations to first derive the linearized version of the above non-linear equations, namely:

$$\ln \hat{y} = \ln k + cx$$

and

$$\ln \hat{y} = \ln a + b \ln x,$$

and then comparing these to the original linear equation, $\hat{y} = a + bx$, and its normal equations (see equations (8) and (9)).

Also discussed is the quadratic model, $\hat{y} = a + bx + cx^2$ which, even though is a non-linear model, can be discussed directly using the linear methodology. But now we have to solve simultaneously a system of 3 equations in 3 unknowns, because the normal equations for the quadratic model become:

$$\begin{aligned} na + b \sum_{i=1}^n x_i + c \sum_{i=1}^n x_i^2 &= \sum_{i=1}^n y_i \\ a \sum_{i=1}^n x_i + b \sum_{i=1}^n x_i^2 + c \sum_{i=1}^n x_i^3 &= \sum_{i=1}^n x_i y_i \\ (25) \quad a \sum_{i=1}^n x_i^2 + b \sum_{i=1}^n x_i^3 + c \sum_{i=1}^n x_i^4 &= \sum_{i=1}^n x_i^2 y_i \end{aligned}$$

A procedure is also discussed which allows us to fit these four models (i.e. linear, exponential, power, quadratic), and possibly others, to the same data set, and then select the equation which fits the data set “best”. These four models are used extensively in forecasting and, because of this, it is important to understand how these models are constructed and how MINITAB can be used to estimate such models efficiently.

4.1. The Linear Model and its Normal Equations

The linear model and the normal equations associated with it as explained above, are given by:

Linear Model

$$y = a + bx \tag{1}$$

Normal Equations

$$na + b \sum_{i=1}^n x_i = \sum_{i=1}^n y_i \tag{8}$$

$$a \sum_{i=1}^n x_i + b \sum_{i=1}^n x_i^2 = \sum_{i=1}^n x_i y_i \tag{9}$$

4.2. The Exponential Model

The *exponential model* is defined by the equation:

$$\hat{y} = ke^{cx} \quad (26)$$

Our objective is to use the given data to find the best possible values for k and c , just as our objective in equation (1) was to use the data to find the best (in the least-square sense) values for a and b .

Taking natural logarithms (i.e. logarithms to the base e) of both sides of equation (26) we obtain

$$\ln(\hat{y} = ke^{cx})$$

or

$$\ln \hat{y} = \ln(ke^{cx}) \quad (27)$$

4.2.1. Logarithmic Laws

To simplify equation (27), we have to use some of the following laws of logarithms:

i) $\log(A \cdot B) = \log A + \log B$ (28)

ii) $\log(A/B) = \log A - \log B$ (29)

iii) $\log(A^n) = n \log A$ (30)

Then, using equation (28) we can re-write equation (27) as:

$$\ln y = \ln k + \ln e^{cx} \quad (31)$$

and, by applying equation (30) to the second term of the right hand side of equation (31), equation (31) can be written finally as:

$$\ln y = \ln k + cx(\ln e)$$

or

$$\ln y = \ln k + cx \quad (\text{because } \ln e = \log_e e = 1) \quad (32)$$

Even though equation (26) is non-linear, as can be verified by plotting y against x , equation (32) is linear (i.e. the logarithmic transformation changed equation (26) from non-linear to linear) as can be verified by plotting: $\ln y$ against x .

But, if equation (32) is linear, it should be similar to equation (1), and must have a set of normal equations similar to the normal equations of the linear model (see equations (8) and (9)).

Question: How are these normal equations going to be derived?

Answer: We will compare the “transformed linear model”, i.e. equation (32), to the actual linear model (equation (1)), note the differences between these two models, and then make the appropriate changes to the normal equations of the linear model to obtain the normal equations of the “transformed linear model”.

4.2.2. Comparison of the Logarithmic Transformed Exponential Model to the Linear Model

To make the comparison easier, we list below the 2 models under consideration, namely:

a) Original Linear Model:

$$y = a + bx \quad (1)$$

b) Transformed Linear Model:

$$\ln y = \ln k + cx \quad (32)$$

Comparing equations (1) and (32), we note the following three differences between the two models:

- i. y in equation (1) has been replaced by $\ln y$ in equation (32)
- ii. a in equation (1) has been replaced by $\ln k$ in equation (32)
- iii. b in equation (1) has been replaced by c in equation (32)

4.2.3. Normal Equations of Exponential Model

When the three changes listed above are applied to the normal equations of the actual linear model (equations (8) and (9)), we will obtain the normal equations of the “transformed model”. The normal equations of the “transformed linear model” are:

$$n(\ln k) + c \sum_{i=1}^n x_i = \sum_{i=1}^n \ln y_i \quad (33)$$

$$(\ln k) \sum_{i=1}^n x_i + c \sum_{i=1}^n x_i^2 = \sum_{i=1}^n x_i (\ln y_i) \quad (34)$$

In equations (33) and (34) all the quantities are known numbers, derived from the given data as will be shown later, except for: $\ln k$ and c , and equations (33) and (34) must be solved simultaneously for $\ln k$ and c .

Suppose that for a given data set, the solution to equations (33) and (34) produced the values:

$$\ln k = 0.3 \quad \text{and} \quad c = 1.2 \quad (35)$$

If we examine the exponential model (equation (26)), we observe that the value of $c = 1.2$ can be substituted directly into equation (26), but we do not yet have the value of k ; instead we have the value of $\ln k = 0.3$!

Question: If we know: $\ln k = 0.3$, how do we find the value of k ?

Answer: If $\ln k = 0.3$, then: $k = e^{0.3} \approx (2.718281828)^{0.3} \approx 1.349859$

Therefore, now that we have both the k and c values, the non-linear model, given by equation (26), has been completely estimated.

4.3. The Power Model

Another non-linear model, which can be analyzed in a similar manner, is the Power Model defined by the equation:

$$\hat{y} = ax^b \quad (36)$$

which is non-linear if $b \neq 1$ and, as before, we must obtain the best possible values for a and b (in the least-square sense) using the given data.

4.3.1. Logarithmic Transformation of Power Model

A logarithmic transformation of equation (36) produces the “transformed linear model”

$$\ln y = \ln a + b \ln x \quad (37)$$

When equation (37) is compared to equation (1), we note the following 3 changes:

- i. y in equation (1) has been replaced by $\ln y$ in equation (37)
- ii. a in equation (1) has been replaced by $\ln a$ in equation (37) (38)
- iii. x in equation (1) has been replaced by $\ln x$ in equation (37)

When the changes listed in (38) are substituted into equations (8) and (9), we obtain the normal equations for this “transformed linear model” which are given by equations (39) and (40) below:

4.3.2. Normal Equations of Power Model

$$n(\ln a) + b \sum_{i=1}^n \ln x_i = \sum_{i=1}^n \ln y_i \quad (39)$$

$$(\ln a) \sum_{i=1}^n \ln x_i + b \sum_{i=1}^n (\ln x_i)^2 = \sum_{i=1}^n (\ln x_i)(\ln y_i) \quad (40)$$

Equations (39) and (40) must be solved simultaneously for $(\ln a)$ and b .

If $\ln a = 0.4$, then $a = e^{0.4} \approx (2.718251828)^{0.4} \approx 1.491825$ and, since we have numerical values for both a and b , the non-linear model defined by equation (36) has been completely estimated.

4.4. Derivation of the normal equations for the Quadratic model, $y = a + bx + cx^2$

To derive the normal equations of the quadratic model, first form the function

$$Q(a, b, c) = \sum_{i=1}^n [y_i - a - bx_i - cx_i^2]^2 \quad (41)$$

Then take the partial derivatives: $\frac{\partial Q}{\partial a}$, $\frac{\partial Q}{\partial b}$, $\frac{\partial Q}{\partial c}$, and set each equal to 0, to obtain the 3 equations needed to solve for a, b, c .

We obtain:

$$\frac{\partial Q}{\partial a} = +2 \sum_{i=1}^n [y_i - a - bx_i - cx_i^2] (-1) = 0,$$

or:

$$na + b \sum_{i=1}^n x_i + c \sum_{i=1}^n x_i^2 = \sum_{i=1}^n y_i \quad (42)$$

$$\frac{\partial Q}{\partial b} = +2 \sum_{i=1}^n [y_i - a - bx_i - cx_i^2] (-x_i) = 0,$$

or:

$$a \sum_{i=1}^n x_i + b \sum_{i=1}^n x_i^2 + c \sum_{i=1}^n x_i^3 = \sum_{i=1}^n x_i y_i \quad (43)$$

$$\frac{\partial Q}{\partial c} = +2 \sum_{i=1}^n [y_i - a - bx_i - cx_i^2] (-x_i^2) = 0,$$

or:

$$a \sum_{i=1}^n x_i^2 + b \sum_{i=1}^n x_i^3 + c \sum_{i=1}^n x_i^4 = \sum_{i=1}^n x_i^2 y_i \quad (44)$$

Equations (42), (43), and (44) are identical to equation (25).

4.5. Data Utilization in Estimating the 4 Models

To generate the quantities needed to estimate the 4 models:

- a. The Linear Model
- b. The Exponential Model
- c. The Power Model,
- d. The Quadratic Model,

the given (x, y) bivariate data must be “manipulated” as shown in Tables: 5, 6, 7, and 8, respectively.

4.5.1. Given Data to Evaluate the Linear Model

Table 5. Manipulation of Given Data to Evaluate the Linear Model

x	y	xy	x^2
x_1	y_1	$x_1 y_1$	x_1^2
x_2	y_2	$x_2 y_2$	x_2^2
x_3	y_3	$x_3 y_3$	x_3^2

...
x_n	y_n	$x_n y_n$	$x_n^2 x_n^2$
$\sum_{i=1}^n x_i$	$\sum_{i=1}^n y_i$	$\sum_{i=1}^n x_i y_i$	$\sum_{i=1}^n x_i^2$
N_1	N_2	N_3	N_4

To evaluate $y = a + bx$, substitute: N_1, N_2, N_3, N_4 into equations (8) and (9) and solve for a and b simultaneously.

4.5.2. Given Data to Evaluate the Exponential Model

Table 6. Manipulation of Given Data to Evaluate the Exponential Model

x	y	x^2	$\ln y$	$x \ln y$
x_1	y_1	x_1^2	$\ln y_1$	$x_1 \cdot \ln y_1$
x_2	y_2	x_2^2	$\ln y_2$	$x_2 \cdot \ln y_2$
x_3	y_3	x_3^2	$\ln y_3$	$x_3 \cdot \ln y_3$
...
x_n	y_n	x_n^2	$\ln y_n$	$x_n \cdot \ln y_n$
$\sum_{i=1}^n x_i$	$\sum_{i=1}^n y_i$	$\sum_{i=1}^n x_i^2$	$\sum_{i=1}^n \ln y_i$	$\sum_{i=1}^n x_i \ln y_i$
N_5	N_6	N_7	N_8	N_9

To evaluate $y = ke^{cx}$, substitute N_5, N_7, N_8, N_9 into equations (33) and (34) and solve for $\ln k$ and c simultaneously.

4.5.3. Given Data to Evaluate the Power Model

Table 7. Manipulation of Given Data to Evaluate the Power Model

x	y	$\ln x$	$(\ln x)^2$	$(\ln x)(\ln y)$	$\ln y$
x_1	y_1	$\ln x_1$	$(\ln x_1)^2$	$(\ln x_1)(\ln y_1)$	$\ln y_1$
x_2	y_2	$\ln x_2$	$(\ln x_2)^2$	$(\ln x_2)(\ln y_2)$	$\ln y_2$
x_3	y_3	$\ln x_3$	$(\ln x_3)^2$	$(\ln x_3)(\ln y_3)$	$\ln y_3$
...
x_n	y_n	$\ln x_n$	$(\ln x_n)^2$	$(\ln x_n)(\ln y_n)$	$\ln y_n$
$\sum_{i=1}^n x_i$	$\sum_{i=1}^n y_i$	$\sum_{i=1}^n \ln x_i$	$\sum_{i=1}^n (\ln x_i)^2$	$\sum_{i=1}^n (\ln x_i)(\ln y_i)$	$\sum_{i=1}^n \ln y_i$
N_{10}	N_{11}	N_{12}	N_{13}	N_{14}	N_{15}

To evaluate $\hat{y} = ax^b$, substitute $N_{12}, N_{13}, N_{14}, N_{15}$ into equations (39) and (40) and solve simultaneously for $(\ln a)$ and b .

4.5.4. Given Data to Evaluate the Quadratic Model

Table 8. Manipulation of Given Data to Evaluate the Quadratic Model

x	y	x^2	x^3	xy	x^4	$x^2 y$
x_1	y_1	x_1^2	x_1^3	$x_1 y_1$	x_1^4	$x_1^2 y_1$
x_2	y_2	x_2^2	x_2^3	$x_2 y_2$	x_2^4	$x_2^2 y_2$
x_3	y_3	x_3^2	x_3^3	$x_3 y_3$	x_3^4	$x_3^2 y_3$
...
x_n	y_n	x_n^2	x_n^3	$x_n y_n$	x_n^4	$x_n^2 y_n$
$\sum_{i=1}^n x_i$	$\sum_{i=1}^n y_i$	$\sum_{i=1}^n x_i^2$	$\sum_{i=1}^n x_i^3$	$\sum_{i=1}^n x_i y_i$	$\sum_{i=1}^n x_i^4$	$\sum_{i=1}^n x_i^2 y_i$
N_{16}	N_{17}	N_{18}	N_{19}	N_{20}	N_{21}	N_{22}

To evaluate $y = a + bx + cx^2$, substitute N_{16} , N_{17} , N_{18} , N_{19} , N_{20} , N_{21} , N_{22} into equations (42), (43), and (44), and solve simultaneously for a , b , and c .

5. Selecting the Best-Fitting Model

5.1. The Four Models Considered

Given a data set (x_i, y_i) , we have shown how to fit to such a data set four different models, namely:

a. Linear:

$$\hat{y}_i = a + bx_i \tag{45}$$

b. Exponential:

$$\hat{y}_i = ke^{cx_i} \tag{46}$$

c. Power:

$$\hat{y}_i = ax_i^b \tag{47}$$

d. Quadratic:

$$\hat{y}_i = a + bx_i + cx_i^2 \tag{48}$$

We might decide to fit all four models to the same data set if, after examining the scatter diagram of the given data set, we are unable to decide which of the “4 models appears to fit the data BEST.”

But, after we fit the 4 models, how can we tell which model fits the data best?

To answer this question, we calculate the “variance of the residual values” for each of the models, and then “select as the best model” the one with the smallest variance of the residual values.

5.2. Calculating the Residual Values of Each Model and Their Variance

Use each x_i value, of the given data set (x_i, y_i) , to calculate the \hat{y}_i value, from the appropriate model, and then for each i , form the residual:

$$\text{Residual of observation } i = (y_i - \hat{y}_i), \tag{49}$$

for each i .

Then the variance of the residual values is defined by:

$$V(\text{Residual}) = \frac{1}{DOF} \sum_{i=1}^n (y_i - \hat{y}_i)^2, \tag{50}$$

where $DOF = \text{Degrees of Freedom}$.

Note: The DOF are $DOF = n - 2$ for the first three models (Linear, Exponential, Power) due to the fact that each of these 3 models has 2 unknown quantities that need to be evaluated from the data (a and b , k and c , and a and b , respectively) and, as a consequence, 2 degrees of freedom are lost. For the Quadratic model, $DOF = n - 3$ because the model has 3 unknown quantities that need to be estimated and, as a consequence, 3 degrees of freedom are lost.

Using equation (50) to calculate the variance of the residuals for each of the 4 models, we obtain:

$$V(\text{Residual})_{\text{Linear}} = \frac{1}{n-2} \sum_{i=1}^n (y_i - a - bx_i)^2 \quad (51)$$

$$= \frac{1}{n-2} [(y_1 - a - bx_1)^2 + (y_2 - a - bx_2)^2 + \dots + (y_n - a - bx_n)^2] \quad (52)$$

$$V(\text{Residual})_{\text{Exponential}} = \frac{1}{n-2} \sum_{i=1}^n (y_i - ke^{cx_i})^2 \quad (53)$$

$$= \frac{1}{n-2} [(y_1 - ke^{cx_1})^2 + (y_2 - ke^{cx_2})^2 + \dots + (y_n - ke^{cx_n})^2] \quad (54)$$

$$V(\text{Residual})_{\text{Power}} = \frac{1}{n-2} \sum_{i=1}^n (y_i - ax_i^b)^2 \quad (55)$$

$$= \frac{1}{n-2} [(y_1 - ax_1^b)^2 + (y_2 - ax_2^b)^2 + \dots + (y_n - ax_n^b)^2] \quad (56)$$

$$V(\text{Residual})_{\text{Quadratic}} = \frac{1}{n-3} \sum_{i=1}^n (y_i - a - bx_i - cx_i^2)^2 \quad (57)$$

$$= \frac{1}{n-3} [(y_1 - a - bx_1 - cx_1^2)^2 + (y_2 - a - bx_2 - cx_2^2)^2 + \dots + (y_n - a - bx_n - cx_n^2)^2] \quad (58)$$

After the calculation of the 4 variances from equations: (52), (54), (56), and (58), the model with the “smallest” variance is the model which fits the given data set “best”.

We will now illustrate, through an example, how the 4 models we discussed above can be fitted to a given bivariate data set, and then how the “best” model from among them is selected.

5.3. A Considered Example

A sample of 5 adult men for whom heights and weights are measured gives the following results (Table 9).

Table 9. Sample of 5 adult men

#	<i>X = Height</i>	<i>Y = Weight</i>
1	64	130
2	65	145
3	66	150
4	67	165
5	68	170

Problem: Fit the linear, exponential, power, and quadratic models to this bivariate data set and then select as the “best” the model with the smallest variance of the residual values.

5.3.1. Fitting the Linear Model $\hat{y} = a + bx$

To fit the linear model, we must extend the given bivariate data so that we can also calculate

$\sum_{i=1}^n x_i^2$ and $\sum_{i=1}^n x_i y_i$, as shown below, in Table 10:

Table 10. Calculations for bivariate data of 5 adults for the linear model

x^2	<i>x</i>	<i>y</i>	<i>Xy</i>
4096	64	130	8320
4225	65	145	9425
4356	66	150	9900
4489	67	165	11055
4624	68	170	11560

$\sum_{i=1}^5 x_i^2 = 21,790$	$\sum_{i=1}^5 x_i = 330$	$\sum_{i=1}^5 y_i = 760$	$\sum_{i=1}^5 x_i y_i = 50,260$
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We then substitute the generated data into the normal equations for the linear model, namely equations (8) and (9):

$$na + b \sum_{i=1}^n x_i = \sum_{i=1}^n y_i$$

$$a \sum_{i=1}^n x_i + b \sum_{i=1}^n x_i^2 = \sum_{i=1}^n x_i y_i ,$$

and obtain the equations:

$$\begin{cases} 5a + 330b = 760 \\ 330a + 21,790b = 50,260 \end{cases}$$

When these equations are solved simultaneously for a and b we obtain:

$$\begin{cases} a = -508, \text{ and} \\ b = 10 \end{cases}$$

Therefore, the linear model is:

$$\hat{y} = a + bx = -508 + 10x$$

The variance of the residual values for the linear model is calculated as shown below, in Table 11:

Table 11. Variance of the residual values for the linear model

Given X	Given Y	Calculated Y	Residual	(Residual) ²
x	y	$\hat{y} = -508 + 10x$	$y - \hat{y}$	$(y - \hat{y})^2$
64	130	$-508 + 10(64) = 132$	-2	$(-2)^2 = 4$
65	145	$-508 + 10(65) = 142$	+3	$(+3)^2 = 9$
66	150	$-508 + 10(66) = 152$	-2	$(-2)^2 = 4$
67	165	$-508 + 10(67) = 162$	+3	$(+3)^2 = 9$
68	170	$-508 + 10(68) = 172$	-2	$(-2)^2 = 4$
				$\sum_{i=1}^5 (y_i - \hat{y}_i)^2 = 30$

Therefore, the variance of the residual values, for the linear model is:

$$V(\text{Residual})_{\text{Linear}} = \frac{1}{n-2} \sum_{i=1}^n (y_i - \hat{y}_i)^2 = \frac{1}{5-2} (30) = \frac{30}{3} = 10$$

5.3.2. Fitting the Exponential Model $\hat{y} = ke^{cx}$

To fit the exponential model we need to extend the given bivariate data so that we can calculate, in addition to $\sum_{i=1}^5 x_i = 330$ and $\sum_{i=1}^5 x_i^2 = 21,790$, $\sum_{i=1}^5 \ln y_i$ and $\sum_{i=1}^5 (x_i \ln y_i)$ as shown below, in Table 12:

Table 12. Calculations for bivariate data of 5 adults for the exponential model

x^2	x	y	$\ln y$	$x \cdot \ln y$
4096	64	130	4.8675	311.5200
4225	65	145	4.9767	323.4855

4356	66	150	5.011	330.726
4489	67	165	5.1059	342.0953
4624	68	170	5.1358	349.2344
$\sum_{i=1}^5 x_i^2 = 21,790$	$\sum_{i=1}^5 x_i = 330$	$\sum_{i=1}^5 y_i = 760$	$\sum_{i=1}^5 \ln y_i = 25.0966474$	$\sum_{i=1}^5 x_i \cdot \ln y_i = 1657.04468$

We then substitute the generated data into the normal equations for the exponential model (i.e. equations (33) and (34)):

$$n(\ln k) + c \sum_{i=1}^n x_i = \sum_{i=1}^n \ln y_i$$

$$(\ln k) \sum_{i=1}^n x_i + c \sum_{i=1}^n x_i^2 = \sum_{i=1}^n x_i (\ln y_i) ,$$

and obtain the equations:

$$\begin{cases} 5 \ln k + 330c = 25.0967 \\ 30 \ln k + 21,790c = 1657.0447 \end{cases}$$

When these equations are solved simultaneously for $\ln k$ and c , we obtain: $c = 0.06658$ and $\ln k = 0.6251$, or: $k = e^{0.6251} = 1.868432$

Therefore, the exponential model is:

$$\hat{y} = ke^{cx} = 1.868432e^{0.06658x}$$

or

$$\ln y = \ln k + cx = 0.6251 + 0.06658x$$

Then, the variance of the residual values, for the exponential model, is calculated as shown below, in Table 13:

Table 13. Variance of the residual values for the exponential model

x	y	$\hat{y} = ke^{cx} = 1.868432 e^{0.06658x}$	$y - \hat{y}$	$(y - \hat{y})^2$
64	130	$1.868432 e^{0.06658(64)} = 132.4515$	-2.4515	6.0099
65	145	$1.868432 e^{0.06658(65)} = 141.5703$	3.4297	11.7628
66	150	$1.868432 e^{0.06658(66)} = 151.3169$	-1.3169	1.7324
67	165	$1.868432 e^{0.06658(67)} = 161.7346$	3.2654	10.6630
68	170	$1.868432 e^{0.06658(68)} = 172.8694$	-2.8694	8.2336
				$\sum_{i=1}^5 (y_i - \hat{y}_i)^2 = 38.4035$

Therefore, the variance of the residual values, for the exponential model is:

$$V(\text{Residual})_{\text{Exponential}} = \frac{1}{n-2} \sum_{i=1}^n (y_i - \hat{y}_i)^2 = \frac{1}{n-2} \sum_{i=1}^n (y_i - ke^{cx})^2$$

$$= \frac{1}{5-1} \sum_{i=1}^5 [y_i - 1.868432e^{0.06658x_i}]^2$$

$$= \frac{38.4035}{3} = 12.8017$$

5.3.3. Fitting the Power Model, $\hat{y} = ax^b$

To fit the power model we need to extend the given bivariate data set to generate the quantities:

$\sum_{i=1}^n \ln x_i$, $\sum_{i=1}^n (\ln x_i)^2$, $\sum_{i=1}^n \ln y_i$ and $\sum_{i=1}^n (\ln x_i)(\ln y_i)$, and this is accomplished as shown below, in Table 14:

Table 14. Calculations for bivariate data of 5 adults for the power model

x	y	$\ln x$	$(\ln x)^2$	$\ln y$	$(\ln x)(\ln y)$
64	130	4.158883	17.2963085	4.867553	20.2435
65	145	4.1738727	17.42550908	4.976734	20.7723
66	150	4.189654742	17.55320686	5.010635	20.9928
67	165	4.204692619	17.67944002	5.105945	21.4689
68	170	4.219507705	17.80424527	5.135798	21.6705
		$\sum_{i=1}^5 \ln x_i$ =20.9471	$\sum_{i=1}^5 (\ln x_i)^2$ =87.7581	$\sum_{i=1}^5 \ln y_i$ =25.0967	$\sum_{i=1}^5 (\ln x_i)(\ln y_i)$ =105.1505

We then substitute the generated data into the normal equations of the power model, namely equations (39) and (40):

$$n(\ln a) + b \sum_{i=1}^n \ln x_i = \sum_{i=1}^n \ln y_i$$

$$(\ln a) \sum_{i=1}^n \ln x_i + b \sum_{i=1}^n (\ln x_i)^2 = \sum_{i=1}^n (\ln x_i)(\ln y_i)$$

and obtain the equations:

$$\begin{cases} 5 \ln a + 20.9471b = 25.0967 \\ 20.9471 \ln a + 87.7581b = 105.1505 \end{cases}$$

When these equations are solved simultaneously for b and $\ln a$ we obtain:

$$\begin{cases} b = 4.3766, \text{ and} \\ \ln a = -13.316 \end{cases}$$

Therefore, the “linearized” power model becomes:

$$\ln \hat{y} = \ln a + b \ln x = -13.316 + 4.3766x$$

Then the variance of the residual values for the power model is obtained as shown below:

Table 15. Variance of the residual values for the power model

x	y	$\ln x$	$\ln \hat{y} = \ln a + b \ln x$ = -13.316 + 4.3766x	\hat{y}	$y - \hat{y}$	$(y - \hat{y})^2$
64	130	4.158883	$\ln \hat{y}_1 = 4.885768$	132.3920	-2.3920	5.721664
65	145	4.173873	$\ln \hat{y}_2 = 4.95623$	141.6874	3.3126	10.973319
66	150	4.189655	$\ln \hat{y}_3 = 5.020443$	151.4784	-1.47843	2.185667
67	165	4.204693	$\ln \hat{y}_4 = 5.086258$	161.7833	3.2167	10.347159
68	170	4.219508	$\ln \hat{y}_5 = 5.151097$	172.6208	-2.6208	6.868592
						$\sum_{i=1}^5 (y_i - \hat{y}_i)^2$ = 36.09640

Therefore, the variance of the residuals values for the power model is:

$$V(\text{Residual})_{\text{Power}} = \frac{1}{n-2} \sum_{i=1}^n (y_i - ax_i^b)^2 = \frac{36.0964}{3} = 12.0321$$

5.3.4. Fitting the Quadratic Model, $\hat{y} = a + bx + cx^2$

To fit the quadratic model, we need to use the given bivariate data set and extend it to generate the quantities:

$$\begin{aligned} \sum_{i=1}^n X_i &= 330; \sum_{i=1}^n X_i^2 = 21,790; \sum_{i=1}^n X_i^3 = 1,439,460; \sum_{i=1}^n X_i^4 = 95,135,074; \\ \sum_{i=1}^n Y_i &= 760; \sum_{i=1}^n X_i Y_i = 50,260; \sum_{i=1}^n X_i^2 Y_i = 3,325,270 \end{aligned}$$

We then substitute the generated data into the normal equations of the quadratic model (see equation (25)), and obtain:

$$\begin{cases} 5a + 330b + 21,790c = 760 \\ 330a + 21,790b + 1,439,460c = 50,260 \\ 21,790a + 1,439,460b + 95,135,074c = 3,325,270 \end{cases}$$

Solving these 3 equations simultaneously, we obtain $a = -25,236/7$, $b = 730/7$, $c = -5/7$. Therefore, the quadratic function $\hat{y} = f(x)$ is given by:

$$\hat{y} = a + bx + cx^2 = \frac{1}{7}[-23,326 + 730x - 5x^2]$$

The variance of the residual values for the quadratic model is calculated as shown below, in Table 16:

Table 16. Variance of the residual values for the quadratic model

x	y	$\hat{y} = \frac{1}{7}[-25,326 + 730x - 5x^2]$	$y_i - \hat{y}_i$	$(y_i - \hat{y}_i)^2$
64	130	$\hat{y}_1 = 130.5714286$	-0.5714286	0.326530644
65	145	$\hat{y}_2 = 142.7142857$	2.2857143	5.224489861
66	150	$\hat{y}_3 = 153.4285714$	-3.4285714	11.75510184
67	165	$\hat{y}_4 = 162.7142857$	2.2857143	5.224489861
68	170	$\hat{y}_5 = 170.5714286$	-0.5714286	0.326530644
				$\sum_{i=1}^5 (y_i - \hat{y}_i)^2 = 22.85714286$

Therefore, the variance of the residual values for the quadratic model is:

$$V(\text{Residual})_{\text{Quadratic}} = \frac{1}{n-3} \sum_{i=1}^5 (y_i - \hat{y}_i)^2 = \frac{22.85714286}{2} = 11.42857143 \approx 11.4286$$

5.3.5. Summary of Results and Selection of the “Best” Model

We have fitted the 4 models: linear, exponential, power, and quadratic models, calculated the respective residual variances, and have obtained the following results:

a) The linear model is:

$$\hat{y} = a + bx = -508 + 10x$$

with $V(\text{Residual})_{\text{Linear}} = 10$

b) The exponential model is:

$$\hat{y} = ke^{cx} = 1.868432e^{0.06658x}$$

with $V(\text{Residual})_{\text{Exponential}} = 12.8017$

c) The power model is:

$$\ln \hat{y} = \ln a + b \ln x = -13.316 + 4.3766 \ln x$$

with $V(\text{Residual})_{\text{Power}} = 12.0321$

d) The quadratic model is

$$\hat{y} = a + bx + cx^2 = \frac{1}{7}[-25,326 + 730x - 5x^2]$$

with $V(\text{Residual})_{\text{Quadratic}} = 11.4286$

Since the linear model has the smallest variance of the residual values of the 4 models fitted to the same bivariate data set, the linear model is the “best” model (but the other 3 values are very close). The linear model, therefore, will be selected as the “best” model and used for forecasting purposes.

6. MINITAB Solutions

To obtain the MINITAB solutions of the four models we discussed in this paper we do the following:

6.1. Finding the MINITAB Solution for the Linear Model

The data set used to find the MINITAB solution for the linear model is presented in Table 17.

Table 17. Data set in MINITAB for the linear model

MTB > Set C1
DATA> 64 65 66 67 68
DATA> end
MTB > set C2
DATA> 130 145 150 165 170
DATA> end
MTB > Name C1 'X' C2 'Y'
MTB > REGRESS 'Y' 1 'X'

The results of the regression analysis for the linear model is presented in Table 18.

Table 18. Regression analysis: Y versus X for the linear model

Regression equation:		Y = - 508 + 10.0 X			
Predictor	Coef	SE Coef	T	p	
Constant	-508.000	66.020	-7.700	0.005	
X	10.000	1.000	10.000	0.002	
Regression fit:	S	R-Sq	R-Sq (adj)		
	3.162	97.1%	96.1%		

Analysis of Variance:					
Source	DF	SS	MS	F	p
Regression	1	1000.0	1000.0	100.0	0.002
Residual Error	3	30.0	10.0		
Total	4	1030.0			

6.2. Finding the MINITAB Solution for the Exponential Model

The data set used to find the MINITAB solution for the exponential model is presented in Table 19.

Table 19. Data set in MINITAB for the exponential model

MTB > Set C1
DATA> 64 65 66 67 68
DATA> end
MTB > set C2
DATA> 130 145 150 165 170
DATA> end
MTB > Name C1 'X' C2 'Y'
MTB > REGRESS 'Y' 1 'X'

The results of the regression analysis for the exponential model is presented in Table 20.

Table 20. Regression analysis: Y versus X for the exponential model

Regression equation:			Y = 0.625 + 0.0666 X		
Predictor	Coef	SE Coef	T	p	
Constant	0.6251	0.4925	1.27	0.294	
X	0.066580	0.007460	8.92	0.003	
Regression fit:	S	R-Sq	R-Sq (adj)		
	0.0235917	96.4%	95.2%		
Analysis of Variance:					
Source	DF	SS	MS	F	p
Regression	1	0.044329	0.044329	79.65	0.003
Residual Error	3	0.001670	0.000557		
Total	4	0.045999			

6.3. Finding the MINITAB Solution for the Power Model

The data set used to find the MINITAB solution for the power model is presented in Table 21.

Table 21. Data set in MINITAB for the power model

MTB > Set C1
DATA> 4.158883; 4.1738727; 4.189654742; 4.204692619; 4.2195077
DATA> end
MTB > set C2
DATA> 4.867553; 4.976734; 5.010635; 5.105945; 5.135798
DATA> end
MTB > Name C1 'X' C2 'Y'
MTB > REGRESS 'Y' 1 'X'

The results of the regression analysis for the power model is presented in Table 22.

Table 22. Regression analysis: Y versus X for the power model

Regression equation:		Y = - 13.3 + 4.38X			
Predictor	Coef	SE Coef	T	p	
Constant	-13.316	2.069	-6.44	0.008	
X	4.3766	0.4939	8.86	0.003	
Regression fit:	S	R-Sq	R-Sq (adj)		
	0.0237507	96.3%	95.1%		
Analysis of Variance:					
Source	DF	SS	MS	F	p
Regression	1	0.044301	0.044301	78.53	0.003
Residual Error	3	0.001692	0.000564		
Total	4	0.045993			

6.4. Finding the MINITAB Solution for the Wuadratic Model

The data set used to find the MINITAB solution for the quadratic model is presented in Table 23.

Table 23. Data set in MINITAB for the quadratic model

MTB > Set C1
DATA> 64 65 66 67 68
DATA> end
MTB > set C2
DATA> 4096 4225 4356 4489 4624
DATA> end
MTB > SET C3
DATA> 130 145 150 165 170
DATA> END
MTB > NAME C1 'X1' C2 'X2' C3 'Y'
MTB > REGRESS 'Y' 2 'X1' 'X2'

The results of the regression analysis for the quadratic model is presented in Table 24.

Table 24. Regression analysis: Y versus X1, X2 for the quadratic model

Regression equation:		Y = - 3618 + 104 X1 - 0.714 X2			
Predictor	Coef	SE Coef	T	p	
Constant	-3618	3935	-0.92	0.455	
X1	104.3	119.3	0.87	0.474	
X2	-0.7143	0.9035	-0.79	0.512	
Regression fit:	S	R-Sq	R-Sq (adj)		
	3.38062	97.8%	95.6%		
Analysis of Variance:					
Source	DF	SS	MS	F	p
Regression	2	1007.14	503.57	44.06	0.022
Residual Error	2	22.86	11.43		
Total	4	1030.00			
Source	DF	Seg SS			
X1	1	1000.00			
X2	1	7.14			

7. Conclusions

Reviewing our previous discussion we come to the following conclusions:

The Linear Regression problem is relatively easy to solve and can be handled using algebraic methods.

The problem can also be solved easily using available statistical software, like MINITAB.

Even though the solution to Regression problems can be obtained easily using MINITAB (or other statistical software) it is important to know what the hand methodology is and how it solves these problems before you can properly interpret and understand MINITAB's output.

In general, non-linear regression is much more difficult to perform than linear regression.

There are, however, some simple non-linear models that can be evaluated relatively easily by utilizing the results of linear regression.

The non-linear models analyzed in this paper are: Exponential Model, Power Model, Quadratic Model.

A procedure is also discussed which allows us to fit to the same bivariate data set many models (such as: linear, exponential, power, quadratic) and select as the "best fitting" model the model with the "smallest variance of the residuals".

In a numerical example, in which all 4 of these models were fitted to the same bivariate data set, we found that the Linear model was the "best fit", with the Quadratic model "second best". The Power and Exponential models are "third best" and "fourth best" respectively, but are very close to each other.

The evaluation of these models is facilitated considerably by using the statistical software package MINITAB which, in addition to estimating the unknown parameters of the corresponding models, also generates additional information (such as the p-value, standard deviations of the parameter estimators, and R^2).

This additional information allows us to perform hypothesis testing and construct confidence intervals on the parameters, and also to get a measure of the "goodness" of the equation, by using the value of R^2 . A value of R^2 close to 1 is an indication of a good fit.

The MINITAB solution for the linear model shows that both a and b (of $\hat{y} = a + bx = -508 + 10x$) are significant because the corresponding p-values are smaller than $\alpha = 0.05$, while the value of $R^2 = 97.1\%$, indicating that the regression equation explains 97.1% of the variation in the y-values and only 2.9% is due to other factors.

The MINITAB solution for the quadratic model shows that a, b, and c (of $\hat{y} = a + bx + cx^2 = -3,618 + 104.3x + 0.7143x^2$) are individually not significant (because of the corresponding high p-values, but b and c jointly are significant because of the corresponding p-value of $p = 0.022 < \alpha = 0.05$. The value of R^2 is: $R^2 = 97.8\%$.

The MINITAB solution for the power model shows that both a and b (of $\hat{y} = ax^b$ or $\ln y = \ln a + b \ln x = -13.3 + 4.3766 \ln x$) are significant because the corresponding p-values are smaller than $\alpha = 0.05$, while the value of $R^2 = 96.3\%$.

The MINITAB solution for the exponential model shows that the k (in $\hat{y} = ke^{cx} = 1.868432e^{0.06658x}$ or $\ln \hat{y} = \ln k + cx = 0.6251 + 0.06658x$) is not significant because of the corresponding high p-value, while the c is significant because of the corresponding p-value being smaller than $\alpha = 0.05$. The value of $R^2 = 96.4\%$.

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