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The impact of effectuation on the performance of South African medium and high technology firms

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Wits Business School

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ABSTRACT

South Africa is blighted by high levels of unemployment and poverty. Entrepreneurship and particularly technology entrepreneurship has been seen as a possible solution to generate innovation, grow the economy and create jobs, thus reducing poverty. However, the country has struggled to commercialise its research output. This research sought to empirically test the effectiveness of the non-predictive strategy, effectuation, in improving technology commercialisation amongst South African firms. Effectuation was considered as a moderator of the EO-performance relationship amongst firms. Further, the research also tackled a research gap by exploring relationships between effectuation and established entrepreneurship and management theories such as EO and environmental hostility. Questionnaires were distributed to South African companies via email containing the web link to the survey on Qualtrics. Of the 500 emails sent, 94 companies responded with usable responses. Multiple regression analysis was used as the main statistical tool to test the hypotheses. The main findings of this study are that, for entrepreneurial high and medium technology companies, EO and environmental hostility positively predict effectuation. Further, effectuation positively moderates the relation between EO and innovative performance. The results of this study suggest entrepreneurial firms, Venture Capitalists (VCs) and government officials who wish to optimise innovative performance should revisit their emphasis on causal planning and market research.

DECLARATION

I, Thanti Sibonelo Mthanti, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Thanti Sibonelo Mthanti

Signed at ……

On the …….. day of …… 2012

DEDICATION

This thesis is dedicated to my late parents Nomsa Caldas Mthanti and Fanley Hendry Mthanti. Mom and Dad, I hope I made you proud.

ACKNOWLEDGEMENTS

I would like to thank my supervisors Dr Barreira and Professor Urban for your guidance over the last 15 months. Further, I would thank Mrs Merle Werbeloff. Your guidance, assistance and teaching have made me grow as a person. I will certainly miss the conversations we had. I hope you will be proud of this work.

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Finally, I would like to thank my little girl Nephadi. Your daddy's "big book" is done now. I hope you will read it someday.

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Chapter 1: Introduction

1.1 INTRODUCTION

1.1.1 Purpose of the study

The purpose of this research is to test the moderating impact of effectuation on the relationship between entrepreneurial orientation (EO) and high technology firm performance in a hostile environment. The research will consider whether effectuation influences performance in the South African high technology sector. Further, the study also addresses a research gap suggested by Perry, Chandler and Markova (2011) in terms of exploring relationships between effectuation and established entrepreneurship and management theories such as EO and environmental hostility.

1.1.2 Context of the study

South Africa is blighted by high levels of unemployment and poverty. From 2000 until 2008, South Africa's unemployment rate averaged 26.38%. It reached a historical high of 31.20% in March 2003 and a record low of 25% in September of 2007 (Statistics South Africa, 2011). In the first quarter of 2011, the unemployment rate in South Africa was 25.7 %, one of the highest in the world (Statistics South Africa, 2011).

The United Nations has developed a measure of human development, called the Human Development Index (HDI). The HDI assesses citizens of a particular country in terms of longevity, knowledge and income. South Africa is ranked 121st out of 177 countries with an HDI score of 0.674 (Venter, Urban and Rwigema, 2007). The HDI is

deemed a strong indicator of poverty levels (Venter et al., 2007). In contrast to other emerging markets that have shown an improvement, South Africa's HDI score has tended to decline (Venter et al., 2007). Unemployment and poverty rates seem to be on the increase. These challenges are rooted in historical inequality and are a direct result of apartheid (Venter et al., 2007).

The South African government has sought to ameliorate this social deficit by introducing social grants/welfare. These initiatives have fallen short of expectations, largely due to the scale of the social deficit and a limited tax base.

Entrepreneurship and particularly technology entrepreneurship has been seen as a possible solution to generate innovation, grow the economy and create jobs, thus reducing poverty. The government has launched a wide array of initiatives: the Technology Innovation Agency (TIA), SEDA Technology Programme (STP), the National Technology Transfer Centre (NTTC), the Industrial Development Corporations' (IDC) Venture Capital Fund and the Jobs Fund. These initiatives have been implemented to foster, secure and accelerate the creation and growth of technology ventures.

The 1996 White Paper on Science and Technology, the 2002 National Research and Development Strategy and in 2007 the Ten-Year Innovation initiated the system of innovation (NSI) concept. Over the subsequent decade, research and development expenditure has increased fivefold from R4 billion to R21 billion and 14000 scientists, engineers, technologists, technicians, managers and other technical staff are now directly involved in research and development (OECD Innovation Review, 2007).

Further, South Africa has targeted gross expenditure on research and development to be 1, 5% of GDP by 2014. The 2007 OECD review of the NSI indicates that South Africa is a world leader in research in fields such as environment/ecology, social science, engineering, plant and animal sciences and clinical medicine (OECD Innovation Review, 2007). However, the OECD review suggested a critical need to ensure the flow of innovation through to commercialisation.

South Africa has struggled to commercialise its research output. Even though many statistics that typically measure the knowledge economy progress have improved from the 1990s, South Africa still trails other middle-income countries (Lorentzen, 2009). Upper middle-income countries have increased their share of technological and scientific output, along with research and development (R&D). Further, they have increased investments and royalty payments and receipts. Although part of the middle-income group, South Africa has fallen behind in the past decade (Lorentzen, 2009). Nevertheless, how firms go about innovating and the dynamics of technological upgrading at the micro level have yet to be explored on a large scale in emerging markets, let alone in South Africa (Lorentzen, 2009).

Further, high technology ventures seem to be characterised by both high potential future profits and high uncertainty (Blanco, 2007). Knight (1921) conceptualised high uncertainty as consisting of non-existent distributions where the very instances are unclassifiable. This description might be particularly apt for the uncertainty South African high technology ventures face. Besides dealing with new entry, which in a high technology context introduces more novelty, new eventualities related to R&D and specific constraints and risks (Blanco, 2007), South African high technology firms face

additional uncertainty because they operate in an emerging market characterised by high interest rates and currency volatility, racial polarisation and a volatile regional political environment.

In addition, environmental turbulence seems to be a major catalyst for entrepreneurial activity in transition economies since the more dynamic, hostile and complex the environment, the higher the level of innovation, risk-taking and proactivity among the most successful entrepreneurial firms (Hitt, Dacin, Levitas, Arregle and Borza. 2000). Lau and Bruton (2011) argue that entrepreneurs and the start-ups they establish produce prosperity in locations conventionally hostile to private enterprise through prospector and guerrilla strategies, extensive networking and altering boundaries. Further, they posit that effective strategies in an emerging market should strengthen the firm's capabilities to produce more innovative products and processes. Lastly, they suggest strategies that strengthen the firm's capabilities in such areas allow the entrepreneurial firms to enhance their competitiveness and that this is particularly important in the high technology industry which commonly relies on differentiation. In sum, appropriate entrepreneurial and strategic orientations are crucial for entrepreneurial high technology firms in South Africa since they face an institutional environment, which is hostile and more turbulent than in those developed economies and high-technology ventures that possess a high EO can explore and exploit opportunities more easily than those that do not (Li and Li, 2009).

Managers, Venture Capitalists (VCs) and the government might be interested, as they invest resources, to know how successful entrepreneurs deploy technology and create new markets in conditions of high uncertainty. This research will seek to test empirically

the effectiveness of non-predictive strategies pursued. Essentially, for an entrepreneurial firm, what is the optimal strategic posture in a hostile environment?

1.2 Problem statement

1.2.1 Main problem

Entrepreneurial South African high technology firms face high uncertainty, which may have an impact on performance. Although much research has been conducted on the EO-performance relationship, little is known about effectuation as a moderator of the EO-performance relationship in a hostile environment. Rauch, Wiklund, Lumpkin and Frese (2009) and Miller (2011) suggest that the EO-performance relationship might be improved by examining potential moderators such as strategy pursued and environmental hostility.

1.2.2 Sub-problems

The first sub-problem is to test the relation between effectuation and established constructs in entrepreneurship literature such as EO and hostility.

Sub-problems

The second sub-problem is to test whether effectuation moderates the relation between EO and performance in high technology firms based in South Africa.

Sub-problems

The third sub-problem is to test whether environmental hostility moderates the relation between effectuation and performance.

1.3 Significance of the study

The study fills a gap in that there is limited research addressing the moderating impact on EO of effectuation by high technology firms in a hostile environment and the resultant impact on performance. The existing non-experimental empirical effectuation literature has not measured or controlled for environmental uncertainty (Perry et al., 2011). Perry et al. (2011) suggest in the next stage of development of effectuation research, scholars should explore relationships between effectuation and established entrepreneurship and management theories such as EO and environmental hostility.

According to Johns (2006), EO researchers ignore context and compile too many heterogeneous samples, thus making it difficult to derive cumulative results. Entrepreneurship and EO differ according to context, their sources are varied and multifaceted and their performance implications alter from context to context (Miller, 2011). Rauch et al. (2009) also suggest that examining potential moderators such as strategy pursued and environmental hostility might improve the estimate of the true correlation between EO and performance.

The researcher has sought to answer these calls of Miller, Perry et al. and Rauch et al., for future research, building on previous findings to evaluate effectuation as a moderator of the EO-performance relationship and environmental hostility as a moderator of the effectuation-performance relationship in a specific context: high technology firms based in South Africa. Further, the researcher has sought to positively link effectuation to established constructs in entrepreneurship research, namely: EO and environmental hostility.

Testing the moderating impact of effectuation on the relation between EO and performance requires a methodology that allows us to test for correlation and causation between the variables. Thus, due to the confirmatory nature of our research, a quantitative approach using factor analysis and regression analysis as the most appropriate. Exploratory factor analysis facilitates ascertaining construct and discriminant validity and multiple regression analysis assists us in the testing of casual relationships between variables (Hair, Anderson, Babin and Black, 2010).

Potentially, this study could guide entrepreneurs, Venture Capitalists (VCs) and government officials who wish to understand the relation between EO, strategy pursued and performance.

1.4 Delimitations of the study

This study will only address effectuation as a moderator of EO-performance relation. Further, environmental hostility will be evaluated as a moderator of effectuation-performance relation. Other non-predictive strategy formulations such as the value curve creation (Kim and Maubourge, 1997) and backing in to the future (Hayes, 1985) are not addressed. Other moderators are similarly not tackled.

The study will not adopt a longitudinal approach. The current strategy and performance observed will be the subject of study.

The study will address high technology firms operating in South Africa. Other countries are not considered.

1.5 Definition of terms

DTI: the department of Trade and Industry

DV: Dependent variable

EH: Environmental Hostility

EDA: Exploratory Data Analysis

EO: Entrepreneurial Orientation

GoM: Goal-oriented management techniques

HDI: Human Development Index

HRIM: Human resources information management

IDC: Industrial Development Corp

IV: Independent variable

MbO: Management by objectives

MNE: Multinational Enterprise

MTMM: Multitrai, multimethod matrices

NSI: National System of Innovation

R&D: Research and Development

RBV: Resource Based View

SME: Small and medium sized enterprises

SSE: Sum of squared errors

NTTC: National Technology Transfer Centre

TIA: Technology Innovation Agency

VC: Venture Capitalist

1.6 Assumptions

The following assumptions have been made regarding the study:

- The sample respondents will be able to share information on the strategy formation process due to their seniority in the organisation. Lack of knowledge of strategy will negatively affect the credibility of study. In other words, they will have the required knowledge and information
- The total number of respondents will be sufficient to gain adequate data
- Strategy formation information will be conveyed honestly and truthfully by the respondents. False data will have a severely detrimental effect on the study's results.
- The respondent sample will reflect the general experiences of the office within which they work. Non-representative views will skew the results of the study and reduce its validity.

Chapter 2 : Literature review

2.1 Introduction

The EO construct developed from strategy-making process literature such as Mintzberg (1973). Strategy making is a firm-wide endeavour that involves planning, analysis, decision making, culture, value system and mission (Hart, 1992). Strategy making facilitates action and the commitment of resources (Mintzberg, Raisinghani and Theoret, 1976). EO represents the firm level procedures that provide the foundation for entrepreneurial choices and deeds (Lumpkin and Dess, 1996). Therefore, EO may be described as the entrepreneurial strategy-making processes that key decision makers use to implement their organization's objectives and fashion a competitive advantage (Covin, Green and Slevin, 2006).

Mainstream strategic management literature can be divided into two schools of thought: the planning school and the learning school (Brews and Hunt, 1999). The planning school advocates rational strategies that emphasise prediction and the learning school engenders firms to adopt adaptive strategies (Brews and Hunt, 1999). Wiltbank, Dew, Read and Sarasvathy (2006) note that the prescription a firm is to follow is contingent upon how assured the firm is in its ability to forecast fluctuations in its environment. Wiltbank et al. (2006) argue that both adaptive and planning approaches place an emphasis on positioning the organization within an exogenously given environment. The two schools seem to differ only in how they cope with that given uncertainty (Wiltbank et al., 2006).

2.1.1 Creation Theory

On the other hand, entrepreneurship literature can be divided into two schools of thought: discovery theory and creation theory (Alvarez and Barney, 2007). Opportunity is the central construct of entrepreneurship theory (Venkataraman, 1997). Entrepreneurs are said to recognize, find and make opportunities (Alvarez and Barney, 2007; Sarasvathy, Dew, Velamuri, and Venkataraman, 2003). Three important differences of discovery and creation theory are summarised in Table 1.

Table 1: Discovery and creation: alternative theories of entrepreneurial action.

Central assumptions of discovery and creation theories of entrepreneurial action		
	Discovery Theory	Creation Theory
Nature of Opportunities	Opportunities exist, independent of entrepreneurs. Applies a realist philosophy.	Opportunities do not exist independent of entrepreneurs. Applies an evolutionary realist philosophy.
Nature of Entrepreneurs	Differ in some important ways from non-entrepreneurs, ex ante.	May or may not differ from non-entrepreneurs, ex ante. Differences may emerge, ex post.
Nature of Decision Making Context Risky	Risky	Uncertain

Source: Alvarez and Barney (2007, p.13).

Discovery theory stresses the importance of exogenous shocks in opportunity recognition. Shane (2003) suggests technological transformations, political and regulatory vagaries and social and demographic changes can disrupt the competitive balance in a market or industry, hence forming opportunities. Discovery theory suggests that alert entrepreneurs methodically search the environment to discover opportunities to supply new products or services.

Conversely, Sarasvathy and Venkataraman (2011, p.118) question where all these opportunities come from? Further, who leaves opportunities for the vigilant entrepreneur to find and cash in? As an example they ask:

> "**What was the elevator pitch for Starbucks? Coffee consumption in the United States had been on a steady downward trend for almost two decades before Starbucks was created. Could one really argue that this was a market waiting to be tapped by an alert visionary? Nor was it an act of heroic individual creativity—Howard Schultz did not found the original Starbucks company nor was Starbucks the first specialty coffee shop. Peets Coffee was already a niche business in California. The tapestry of the Starbucks we know so well today was painstakingly stitched together from a variety of stakeholder inputs including those from customers, commercial artists, and community leaders who knowingly or unknowingly participated in a co-creation process that has transformed urban landscapes from Seattle to Ankara"**

In contrast to discovery theory, creation theory suggests opportunities are endogenously created by the deeds of entrepreneurs exploring ways to produce new products or services (Baker and Nelson, 2005; Sarasvathy, 2001a). Creation theory assumes that the entrepreneur's actions are the essential source of these opportunities. In this model, entrepreneurs do not wait for exogenous shocks to form opportunities and then provide agency to those opportunities, they act (Baker and Nelson, 2005; Sarasvathy, 2001a).

Additionally, numerous renowned researchers have also questioned the utility of emphasising prediction and/or adapting to exogenously given circumstances (March, 1978, 1982, Simon, 1996, Sarasvathy, 2001a). In the Sciences of the Artificial, Simon (1996) advocates the importance of theories of non-predictive strategy. March (1978,

1982) contends that a technology of foolishness, both non-analytical and non-prophetic, could be beneficial. Sarasvathy (2001a, 2001b) further develops Simon and March's arguments to show how expert entrepreneurs use an effectual logic that is non-predictive to fashion new markets and transform environments. She suggests that firstly, entrepreneurial opportunities are co-constructed through entrepreneurial endeavour; secondly, demographic, regulatory and institutional variations themselves can result from the entrepreneurial process and finally, even when opportunities may originate in demographic, regulatory and technological alterations, they are said to be discoverable partly because of the entrepreneurial process that helped discover them. The most experienced entrepreneurs deliberately implement such a co-creation process—that is, they operate and act in ways that spawn a competitive advantage (Sarasvathy, 2001a, 2001b).

Further, the resource-based theory in strategic management also emphasizes the import of experiential learning and expertise engendered by the process of enacting an opportunity. As that process progresses differently for assorted entrepreneurs, the opportunities that result may be heterogeneous in "costly-to-copy and costly-to-reverse" ways (Barney, 1991, p.106).

In the following paragraphs we will review the literature on some of the key themes that have been introduced in this introductory section: effectuation, EO, environmental hostility and performance. The section will conclude with a summary of key learning.

2.2 Effectuation

Causation involves forecasting the reactions of opposing companies, the course of market progression with its attendant opportunities and threats and factors affecting the costs of resources (Wiltbank, Dew, Read and Sarasvathy, 2006). Predictions come with qualifications about their precision, seek to circumvent exigencies and to manipulate current realities to reach preconceived goals (Wiltbank et al., 2006).

In contrast, effectuation originates through three kinds of resources: Identity; Expertise and Contacts (Sarasvathy, 2001a). Sarasvathy (2001a), Dew (2003) and Sarasvathy and Dew (2005) developed a theory of effectuation generated from two empirical studies; one involving a think-aloud protocol analysis of 27 expert entrepreneurs and another entailing the historical evaluation of unique markets fashioned by the Radio Frequency Identity industry. They found that actors begin with who they are, what they know and whom they know to envisage firms they can found. Further, stakeholder allegiances are secured. Actors assume that future exogenous factors are generally non-existent and endeavour to piece them together through collaboration and goal creation with others to imagine plausible opportunities that can be developed from current resources. Figure 1 below illustrates the effectual process that expert entrepreneurs undertake to create opportunities.

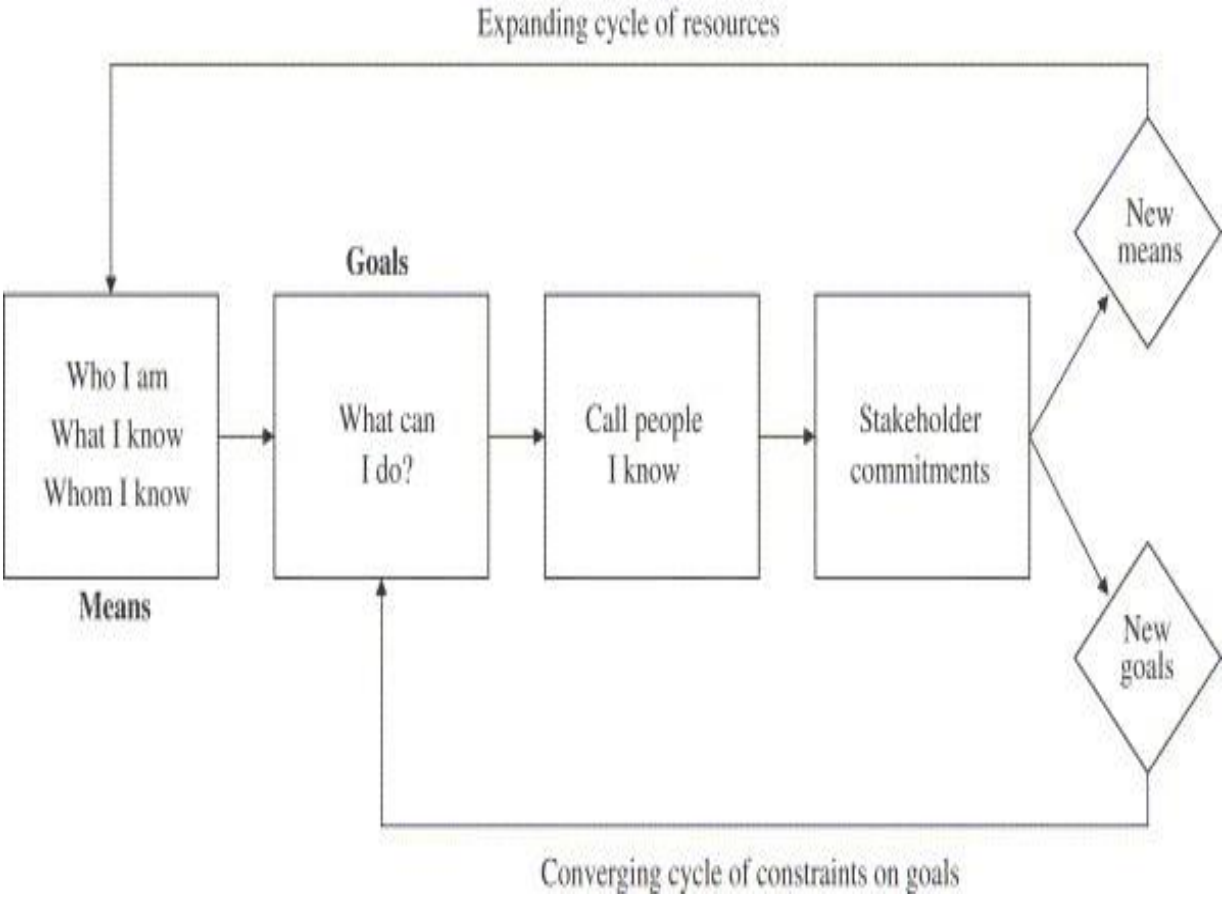


Figure 1: Effectual Process

Source: Sarasvathy, S.D. and Dew, N. (2005, p. 543)

The three main principles that stakeholders use and that provide a basis for effectual action are (Wiltbank et al., 2006, p.992):

• "Means-driven (rather than goal-oriented) action. Each effectual stakeholder considers who he is, what he knows and whom he knows. Stakeholders imagine possible courses of action based on their means and engage others whose strategies are driven by other types of identity, knowledge and networks.

• Affordable loss (rather than expected return) as evaluation criterion. Each effectual stakeholder strives to invest only what he or she can afford to lose.

• Leveraging (rather than avoiding) contingencies. While predictive efforts seek to avoid or hedge against contingencies, effectuation seeks to capitalize on these occurrences".

Whereas predictive strategies are ways to influence current realities to reach preconceived ends, effectual strategies spawn unique goals and new worlds from current realities. An effectual entrepreneur maintains flexibility, utilizes experimentation and seeks to exert control over the future by making alliances with, and getting pre-commitments from, potential suppliers, competitors and customers (Chandler, DeTienne, McKelvie, and Mumford, 2011). Table 2 below contrasts causation and effectuation.

Table 1: Contrasting causation with effectuation

Issue	Causal position	Effectual position
View of the future	*Prediction*. The future is a continuation of the past; can be acceptably predicted	*Design*. The future is contingent on actions by wilful agents
Constructs pertaining to individual decisions		
Givens	*Goals* are given	*Means* (Who I am, what I know, and whom I know) are given
Decision agenda	*Resources*. What resources ought I to accumulate to achieve these goals?	*Effects*. What effects can I create with the means I have?
Basis for taking action	*Desired worlds*. Vision of a desired world determines goals; goals determine sub-goals, commitments, and actions	*Possible worlds*. Means and stakeholder commitments determine possible sub-goals—goals emerge through aggregation of sub-goals
Basis for commitment	*Should*. Do what you ought to do—based on analysis and maximization	*Can*. Do what you are able to do—based on imagination and satisficing
Stakeholder acquisition	*Instrumental view of stakeholders*. Project objectives determine who comes on board	*Instrumental view of objectives*. Who comes on board determines project objectives
Constructs in terms of responses to the environment		
Predisposition toward risk	*Expected return*. Calculate upside potential and pursue (risk adjusted) best opportunity	*Affordable loss*. Calculate downside potential and risk no more than you can afford to lose
Predisposition toward contingencies	*Avoid*. Surprises may be unpleasant. So invest in techniques to avoid or neutralize them.	*Leverage*. Surprises can be positive. So invest in techniques that are open to them and leverage them into new opportunities.
Attitude toward success/failure	*Outcomes*. Success and failure are discrete outcomes to be sought after or avoided, respectively	*Process*. Successes and failures are inputs into a process that needs to be managed such that failures are outlived and successes are accumulated
Attitude toward probability estimates	*Update beliefs*. Estimates are used in a Bayesian fashion—to update ones beliefs about the future.	*Manipulate conditionals*. Estimates signal, which conditionals may, reified or falsified so the future can be skewed through action.
Attitude toward others	*Competition*. Constrain task relationships with customers and suppliers to what is necessary	*Partnership*. Build YOUR market together with customers, suppliers and even prospective competitors
Underlying logic	To the extent we can predict the future, we can control it	To the extent we can control the future, we do not need to predict it

Source: Sarasvathy and Dew (2005, p.390)

2.2.1 Effectuation- Conceptual Literature

Several conceptual articles have addressed theoretical issues underlying effectuation and developed propositions. They have addressed market creation (Sarasvathy, Dew, Velamuri, and Venkataraman, 2003), how firms are created (Sarasvath, 2001), how entrepreneurial firms transform environments in contrast to operating within existing environments (Dew, Read, Sarasvathy and Wiltbank, R., 2008) and to address Christensen's (2000) "Innovators' dilemma" (Dew, Sarasvathy, Read and Wiltbank, 2008). Over the following paragraphs, we will review in detail these conceptual studies and expand on their findings.

Firstly, Sarasvathy, Dew, Velamuri, and Venkataraman, (2003, p.3) contest the notion, advocated by Arrow, inspiring contemporary theories of technological change that assume "when a market could be created, it would be" and yet the history of technological invention is full of unanticipated economic consequences. Literature on entrepreneurial opportunities is based upon three approaches: the market as an allocative process, the market as a discovery process and the market as a creative process (Sarasvathy et al., 2003). The market as an allocative process assumes that markets for goods and services are given and the market merely efficiently allocates resources based on exogenous demand and supply. Approaches based on the view of the market as a discovery process view opportunities as objective reality that merely needs to be recognised and alert entrepreneurs fulfil this task. Sarasvathy et al. (2003, p. 26) suggest that the view of the market as a discovery process is simplistic and as an illustration of this argument, they point out that "before we can recognize or discover great art that art has to have been created". Similarly, this also applies to

entrepreneurial opportunities (Sarasvathy et al., 2003). The creative view, which highlights the judgements and deeds of the agents, making both the geneses and effects dependent upon those decisions and deeds, might be more general than and antecedent to the discovery view (Sarasvathy et al., 2003).

Further, Sarasvathy (2001a, 2001b) addressed, using effectuation, the question of how firms are created. She argues that an explanation for the creation of firms requires the notion of effectuation that rests on “the logic of control, endogenous goal creation and a (partially) constructed environment” (p. 256). Further, she suggests that effectuation could explain the lack of empirical findings from the traits literature and posits that “we need to learn to deal with a rain forest of individuals and firms and markets and societies, intermeshed and woven together with completely coherent yet vastly diverse local patterns that add up to a complex, interdependent ecology of human artefacts and only then can we begin to explain why people of all types seem to build successful companies and other economic artefacts” (p. 258). Figure 2 illustrates the theory of effectuation, which emphasizes that individuals with different traits and aspirations can create lasting effects.

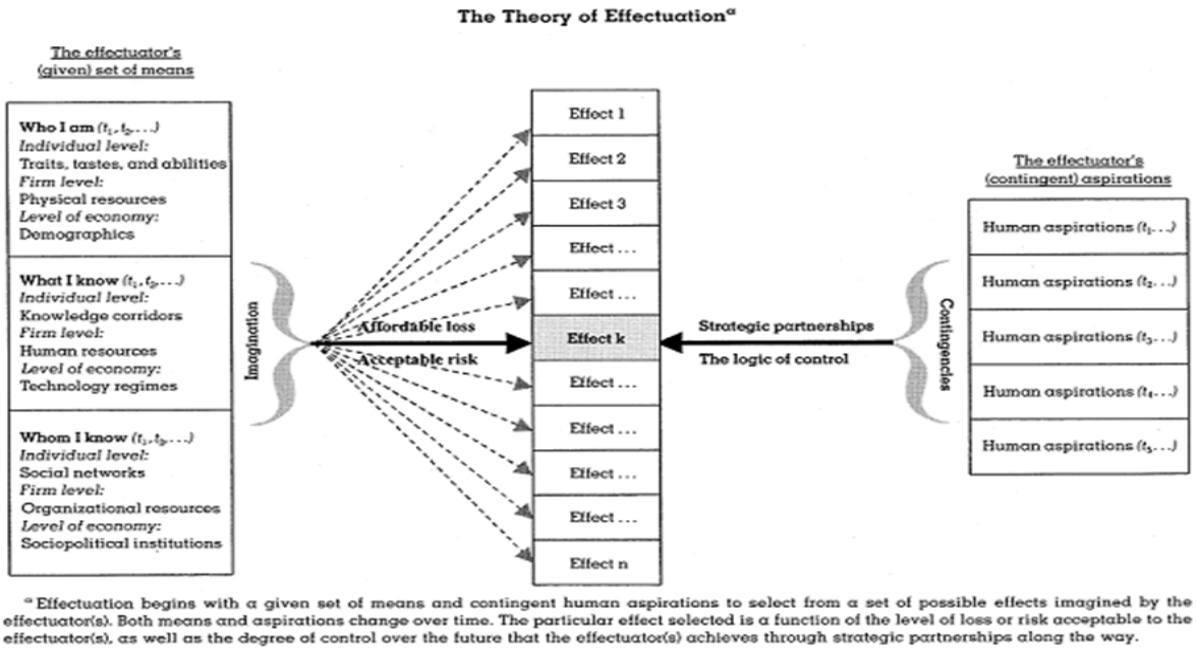


Figure 2: The theory of effectuation

Source: Sarasvathy (2001a, p. 253)

Additionally, effectuation also provides a possible explanation of the behaviour of entrepreneurial firms in transforming environments in contrast to operating within existing environments (Dew, Read, Sarasvathy and Wiltbank, R., 2008). Dew et al. (2008) postulate that the key difference between entrepreneurial firms and existing firms is that firms and markets are not assumed as exogenous in entrepreneurship. They theorise that "either the firms are new, or the markets are new or both" (p. 41). Decision makers are conceived as dividing the environment into parts they can control and parts that are uncontrollable. Entrepreneurs focus on what they can control deploying the means they have to transform the environment.

These alteration processes are characterised as exaptation (Dew et al, 2008). Exaptation describes the process of the creation of unique resource-stakeholder relationships (Dew et al., 2008). Effectual entrepreneurs, “by accumulating stakeholder commitments under goal ambiguity, achieving control through non-predictive strategies and using exaptive orientation, potentially create a broader and different range of variation” (Dew et al., 2008, p.38).

Likewise, Dew, Sarasvathy, Read and Wiltbank (2008) use effectuation to address Christensen’s (2000) “Innovators’ dilemma”. The innovators dilemma tackles situations where entrepreneurial firms using inferior technologies disrupt established firms deploying superior technologies. Dew et al. (2008) argue that the “innovator's dilemma” implies that by listening to current customers existing firms often lose their markets to newcomers as a result. Further, Dew et al. (2008) posit that innovation managers should not seek to predict technology paths more accurately or strive to build immortal firms in mortal markets. Rather, they should focus on building new markets since in an effectual universe needs, wants and desires do not equal demand; and demand and supply does not equate to market. The relationships between supply and demand are “circular, interactive, intermediated and contingent rather than linear, unilateral, independent and inevitable” Dew et al. (2008, p. 321). They argue that not only are markets created through human action; they are also often destroyed through human agency. They contend that the innovator’s dilemma is not the story of better predicting technological trajectories with a view to substituting one technology for another in existing markets. Rather it is a story about technology commercialization – i.e., about

investing in and building new markets. To answer the question of how does one create immortal firms in mortal markets? They suggest “you don’t; you build markets” (p. 324).

Prediction is a central issue in strategic management owing to the presumption that what can be predicted can be controlled, whereas expert entrepreneurs pursue successful outcomes through control-oriented approaches that may be non-predictive (Wiltbank, Dew, Read, and Sarasvathy, 2006). Wiltbank et al. (2006) contend that emphasizing control and managing the failures it might entail, keeping them small and quick, may positively influence the costs and risks of firm strategies as well as the firm’s incessant efforts to innovate. They suggest that creativity and effectuation are important elements of strategizing that make it cheaper by eliminating costs of trying to predict the future as well reducing the costs of failure.

Finally, Dew and Sarasvathy (2002, p.3) have sought to clarify the nine things that effectuation is not. The nine things effectuation does not include are:

- “Effectuation is not merely a set of heuristic deviations from rational choice – it is a non-overlapping alternative paradigm to rational choice.
- Effectuation is not a wholesale replacement for predictive rationality – it exists in parallel to it.
- Effectuation is not irrational or non-rational – it helps, along with other notions, to pluralize the notion of rationality, not to negate it.

- Effectuation is not a random process – it is textured and systematic with eminently learnable and teachable principles, and practical prescriptions of its own.
- Effectuation is not a theory of "anything goes" – it is a theory of constrained creativity.
- Effectuation is not a resource-based view of individual decision-making – it does not assume valuable resources, it enquires into what makes things valuable and how one can acquire and/or create value in resources.
- Effectuation is not just for small, start-up firms – it can be applied to large firms and economies as well.
- Effectuation is not restricted to the domain of entrepreneurship -- just like the philosophy of rational choice, it can under-gird all the sciences of human action (Dew and Sarasvathy, 2002).
- Effectuation is not an independent theory – it builds on and integrates the work of several well-received theories in economics and management."

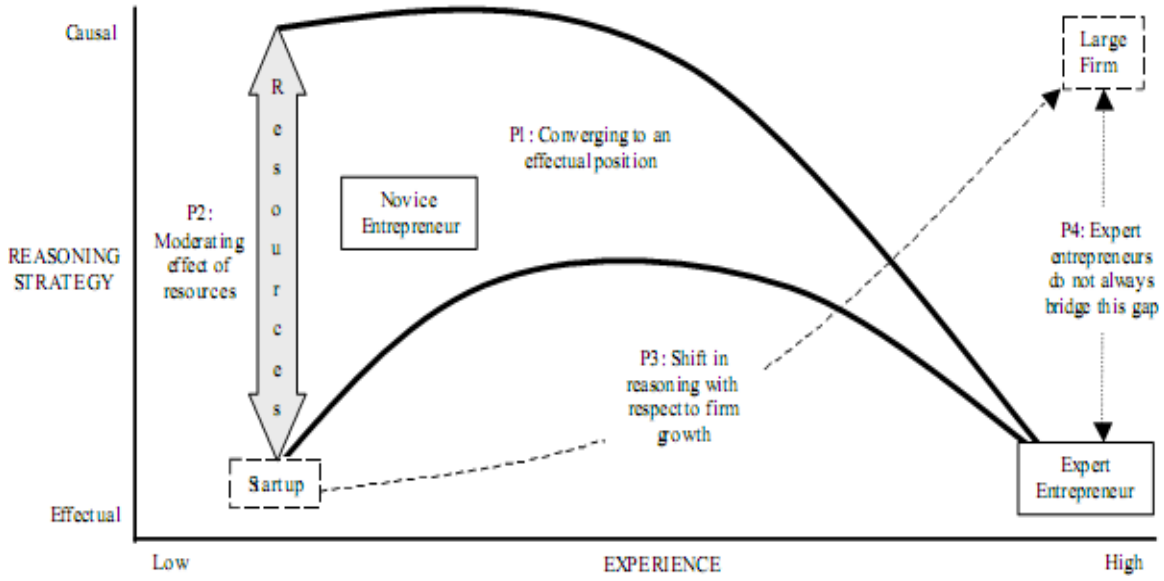
2.2.3 Experimental Effectuation Literature

Most of the early empirical effectuation articles have been experimental studies. Mukhopadhyay, Vicinanza and Prietula (1992) used protocol analysis on a panel of experts in software project cost estimation. Sarasvathy, Simon and Lave (1998) used cluster analysis and protocol analysis to contrast entrepreneurs with bankers in their management of risks. Dew, Read, Sarasvathy and Wiltbank (2009) employed protocol

analysis to ascertain whether expert entrepreneurs framed business decision making problems differently than novices. Read, Dew, Sarasvathy, Song and Wiltbank, (2009) applied protocol analysis to evaluate how 27 expert entrepreneurs approach marketing under uncertainty compared to 37 managers with little entrepreneurial expertise and finally, Andersson (2011) utilised an exploratory case study to explore how effectual born globals internationalised. Over the following paragraphs the researcher will review in detail these experimental studies and expand on their findings.

Dew, Read, Sarasvathy and Wiltbank (2009) used protocol analysis to ascertain whether expert entrepreneurs framed business decision making problems differently than novices. Twenty seven expert entrepreneurs and thirty seven MBA students were asked to think aloud continuously as they unscrambled common decision-making problems in creating a new venture. Transcripts were analysed using methods from cognitive science. They found that expert entrepreneurs identified more potential markets, focused more on building the venture as a whole, paid less attention to predictive information, worried more about making do with resources on hand to invest only what they could afford to lose and emphasize stitching together networks of partnerships. However, MBA students used a “predictive frame” and tended to use causal analytical tools. As Figure 3 illustrates novice entrepreneurs and large firms are theorised to use causal strategy, whereas expert entrepreneurs and start-ups tend to use effectual logic. The relationship between strategy pursued and experience is moderated by resources.

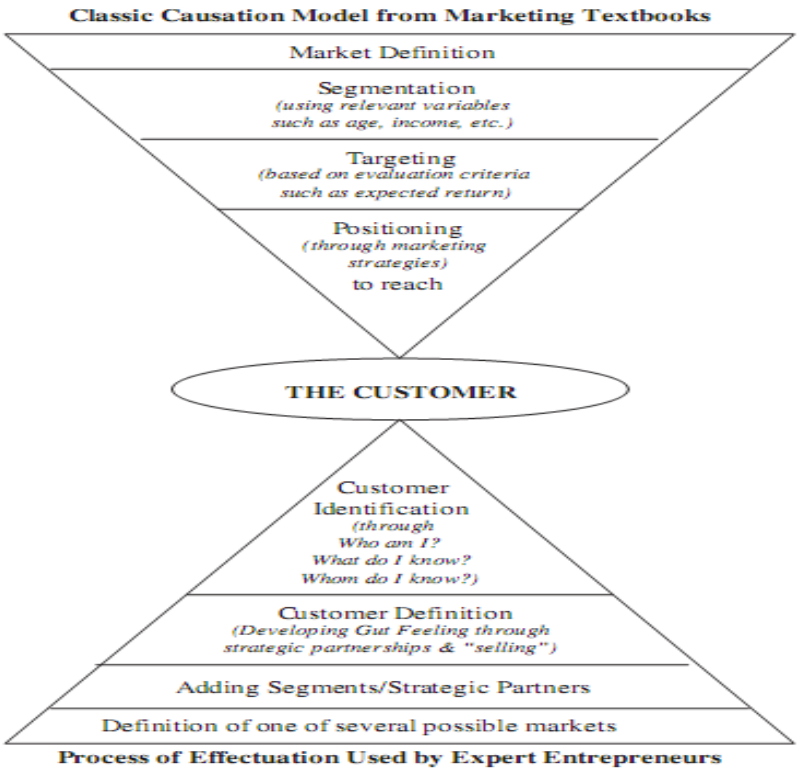
Figure 3: Type of reasoning approach with respect to experience and firm lifecycle



Source: Read and Sarasvathy (2005, p. 36)

Marketing under uncertainty has also been assessed using an effectual frame. Read, Dew, Sarasvathy, Song and Wiltbank (2009) used protocol analysis to evaluate how 27 expert entrepreneurs approach such a problem compared to 37 managers with little entrepreneurial expertise. They found that whereas managers sought to underprice, expert entrepreneurs "have learned that more-for-less is not a good pricing strategy for new products and services" (p. 27). Further, as figure 4 illustrates, they found that expert entrepreneurs are distrustful of market research preferring to co-create or form partnerships with potential customers, suppliers and investors to define and/or co-create the market through using the means at hand.

Figure 4: Contrasting the textbook paradigm in marketing with effectuation



Source: Sarasvathy (2001b, p. 22)

Affordable loss is an effectuation sub-construct that entails managers determining what they are willing to risk by following a particular strategy (Dew, Sarasvathy, Read and Wiltbank, 2009). They evaluate an investment according to whether the business could absorb the loss from the total failure of a venture (Dew et al., 2009). Mukhopadhyay, Vicinanza and Prietula (1992) used protocol analysis on a panel of experts in software project cost estimation. They found that experts utilising affordable loss produced better performance compared to mathematical models and computer simulations.

Bankers, like entrepreneurs, have to deal with decision making under uncertainty Sarasvathy, Simon and Lave (1998) used cluster analysis and protocol analysis to contrast entrepreneurs with bankers in their management of risks. Subjects were four

entrepreneurs and four bankers each with over five years' experience. The entrepreneurs were founders of their companies. Their companies' annual turnover ranged from $5M to $30M. Sarasvathy et al. (1998) found that firstly, entrepreneurs concentrated on controlling the outcomes at any given level of risk, tolerating risk as a given; secondly, they framed their problem spaces based on their personal values and lastly, entrepreneurs accepted greater personal responsibility for success/failure. In contrast, bankers sought to control risk in a systematic way, avoided situations where they were exposed to elevated levels of personal responsibility and focused on targeted outcomes.

Effectuation theory has also been used to study born globals' internationalisation process and the entrepreneur's decision making regarding internationalisation. Andersson (2011) used an exploratory case study to explore how effectual born globals internationalised. He found that effectuating born globals entered multiple markets in a short time by co-operating with local network partners. Further, rapid internationalisation was positively associated with prior knowledge and networks. They argue that since effectuation emphasises strategic alliances and partnerships, it is a useful tool to understand the development of born global firms.

In sum, the effectuation heuristic has been codified from experimental empirical studies. Scholars have studied what entrepreneurs do to cope with uncertainty in different settings- born globals, marketing under uncertainty, finance and software project cost estimation- rather than seek to impose theoretical frame works that are not grounded in reality. Over the following paragraphs, we will review quantitative empirical literature to delineate findings and develop hypothesis.

2.2.4 Empirical Literature and hypotheses development

Effectuation literature is still in its nascent phase of development. Few quantitative, empirical studies have been conducted. Chandler et al. (2011) examined whether the sub-constructs' underlying effectuation are distinct. They found that effectuation formed a multidimensional construct composed of four sub-constructs: affordable loss, experimentation, flexibility and pre-commitments and proposed that effectuation might be better viewed as a formative construct. Read, Song and Smit (2009) conducted an empirical meta-analysis that tested whether there is a positive relationship between effectuation and performance. The relationship between the sub-constructs experimentation, flexibility and pre-commitments and new venture performance was supported. However, the relationship between venture performance and affordable loss was not significant.

Effectuation theory has also been used to study innovation and R&D research performance (Brettel, Mauer, Engelen and Küpper, 2012). Innovativeness is a critical sub-construct of entrepreneurial orientation (EO) and EO has been shown in literature to be positively related to performance (Raunch et al., 2009). Brettel et al. (2011) argue that large companies have difficulties in executing highly innovative R&D. They suggest an effectual approach could be beneficial. Brettel et al. (2012) used expert interviews and a pilot study (123 R&D projects) to develop a multi-factor measurement model of effectuation and causation. These measures were validated in a follow-up study with a larger sample of 400 projects and were used to ascertain whether the effectuation sub-constructs- affordable loss, means driven, partnerships and leveraging contingencies- were positively related to performance. They found that the sub-constructs affordable

loss, preference for partnerships and leveraging contingencies had a positive influence on R&D performance when innovativeness is high, whereas means-driven does not exert any significant influence on R&D output and efficiency when innovativeness is high.

Wiltbank, Dew, Read and Sarasvathy (2009), in a cross sectional study of 121 angel investors who had made 1038 new venture investments established that angel investors who employed an effectual strategy experienced a reduction in investment failures without a reduction in the number of their successes.

Firstly, since a reduction in investment losses for a firm without a corresponding reduction in expected return would imply higher profitability, secondly, since innovation and R&D research performance is crucial to the performance of high technology firms and finally, concomitant with Read et al.'s (2009) findings; we propose that effectuation has a positive relation with perceived performance.

Entrepreneurial strategy formation may be more nascent rather than planned in disposition because it enables entrepreneurial firms to manage the risk fundamental to their ventures (Mintzberg and Waters, 1985). Planned strategies in entrepreneurial firms will frequently suggest inferences should be accepted on conviction and thus are not likely to be confirmed based on the assumptions of strategic planning (Block and MacMillan, 1985; McGrath and MacMillan, 1995). If the crucial assumptions, on which entrepreneurial firms' plans are based, are erroneous, these strategies may not serve the firms' objectives.

Covin et al. (2006) examined the effects of three strategic process variables—strategic decision making participativeness, strategy formation mode, and strategic learning from failure—on the entrepreneurial orientation (EO)–firm sales growth rate relationship. Results based on a sample of 110 manufacturing firms indicated a positive effect of EO on sales growth rate. Further, they found that the relationship between EO and sales growth rate was more positive among firms that employ autocratic decision making and that exhibit an emergent strategy formation process. EO appears to facilitate firm growth when entrepreneurial firms employ strategy development processes that complement the prerequisites of an entrepreneurial posture.

Wiklund and Shepherd (2011) characterize the underlying approach of the majority of previous EO research as "EO-as-advantage"—explained as the view that it pays to pursue an EO—and offer "EO-as-experimentation"—reflecting the notion that EO is concomitant with greater outcome variance, which increases the likelihood of both failure and success. In literature, exploration is associated with experimenting, freely associating and entering into new product markets, while exploitation is associated with "refining, producing, reusing existing routines and improving existing product markets" (Wiklund and Shepherd, 2011, p. 930). Wiklund and Shepherd (2011) provide empirical evidence that supports an EO-as-experimentation perspective. The researcher will adopt this EO-as-experimentation perspective and since effectuation is a multidimensional construct with four associated sub-dimensions: experimentation, affordable loss, pre-commitments and flexibility (Chandler et al., 2011), we propose that EO positively predicts the formative construct effectuation and its sub-constructs experimentation and flexibility.

2.3 Entrepreneurial Orientation

Entrepreneurship is concerned with understanding how, in the absence of markets for future goods and services, these goods and services manage to come into existence (Venkataraman, 1997). It is mainly concerned with new entry either by a start-up or through an existing firm (Lumpkin and Dess, 1996). New entry is the fundamental notion in entrepreneurship (Lumpkin and Dess, 1996).

EO can be regarded as "the processes, practices, and decision-making activities that lead to new entry" (Lumpkin and Dess, 1996, p. 136). Pearce, Fritz, and Davis (2010, p. 219) define EO as "a set of distinct but related behaviors that have the qualities of innovativeness, proactiveness, competitive aggressiveness, risk taking, and autonomy." We know entrepreneurs through their actions, not their traits (Gartner, 1988). The underlying assumption of EO is that action is crucial to the exploration, creation and exploitation of opportunities. Thus, EO can be considered as a firm-level trait that can be deciphered through the display of sustained innovation, risk taking and action (Covin and Lumpkin, 2011). Table 3 lists the definitions of EO as they have evolved from the early 70s till today.

Table 2: Definitions of Entrepreneurial Orientation

Mintzberg (1973)	"In the entrepreneurial mode, strategy-making is dominated by the active search for new opportunities" as well as "dramatic leaps forward in the face of uncertainty" (p. 45).
Khandwalla (1976/1977)	"The entrepreneurial [management] style is characterized by bold, risky, aggressive decision-making" (p. 25, [ ] added).
Miller and Friesen (1982)	"The entrepreneurial model applies to firms that innovate boldly and regularly while taking considerable risks in their product-market strategies" (p. 5).
Miller (1983)	"An entrepreneurial firm is one that engages in product-market innovation, undertakes somewhat risky ventures, and is first to come up with 'proactive' innovations, beating competitors to the punch" (p. 771).
Morris and Paul (1987)	"An entrepreneurial firm is one with decision-making norms that emphasize proactive, innovative strategies that contain an element of risk" (p. 249).
Covin and Slevin (1998)	"Entrepreneurial firms are those in which the top managers have entrepreneurial management styles, as evidenced by the firms' strategic decisions and operating management philosophies.
Merz and Sauber (1995) ".	Non-entrepreneurial or conservative firms are those in which the top management style is decidedly risk-averse, non-innovative, and passive or reactive" (p. 218). entrepreneurial orientation is defined as the firm's degree of proactiveness (aggressiveness) in its chosen product-market unit (PMU) and its willingness to innovate and create new offerings" (p. 554)
Lumpkin and Dess (1996)	"EO refers to the processes, practices, and decision-making activities that lead to new entry" as willingness to innovate and take-risks, and a tendency to be aggressive toward competitors and characterized by one, or more of the following dimensions: "a propensity to act autonomously, a proactive relative to marketplace opportunities" (pp. 136–137).
Zahra and Neubaum (1998)	EO is "the sum total of a firm's radical innovation, proactive strategic action, and risk taking activities that are manifested in support of projects with uncertain outcomes" (p. 124)
Voss, Voss, and Moorman (2005),	". . . we define EO as a firm-level disposition to engage in behaviors [reflecting risk-taking innovativeness, proactiveness, autonomy, and competitive aggressiveness] that lead to change in the organization or marketplace" (p. 1134, [ ] added).
Avlonitis and Salavou (2007)	"EO constitutes an organizational phenomenon that reflects a managerial capability by which firms embark on proactive and aggressive initiatives to alter the competitive scene to their advantage" (p. 567).
Cools and Van den Broeck (2007/2008)	"Entrepreneurial orientation (EO) refers to the top management's strategy in relation to innovativeness, proactiveness and risk taking" (p. 27).
Pearce, Fritz, and Davis (2010)	"An EO is conceptualized as a set of distinct but related behaviours that have the qualities of innovativeness, proactiveness, competitive aggressiveness, risk taking, and autonomy" (p. 219).

Source: Covin and Wales (2011, p.3)

Further, EO is a firm-level phenomenon (Covin and Lumpkin, 2011). If researches view EO as a firm level trait, then logically the appropriate unit of analysis is the firm. Or more precisely as Covin and Lumpkin (2011) suggest the "firm" can range from a non-diversified small to medium-sized enterprise (SME) to a single business unit of a multi-business firm.

Furthermore, there has been debate in the scholarly community about whether EO is a multidimensional (Lumpkin and Dess, 1996) or a unidimensional (Miller 1983, Covin and Slevin, 1989) construct. In the technology sector, EO has been viewed as a unidimensional construct since amongst technology firms risk taking, innovativeness and proactiveness are concurrently displayed (Raunch et al. 2009). Thus one or two of these dimensions is inadequate for an entrepreneurial technology firm.

In sum, for the purposes of this study the researcher adopts the view that EO is sustained behaviour not disposition, unidimensional or multidimensional and the appropriate unit of analysis is the firm. This is consistent with the arguments of Miller (1983) and Covin and Slevin (1989). In contrast, effectuation is viewed as the strategy pursued. The unit of analysis is the firm. We ask: do firms that effectuate, as they innovate, take risks and act, exhibit higher performance?

2.3.1 The Dimensions of EO and Effectuation

EO has three dimensions: innovativeness, risk taking and proactiveness (Miller, 1983, Lumpkin and Dess, 1996, Covin and Slevin, 1997). Innovativeness can be described as the firm's ability and willingness to develop new products and/or services or invent new processes (Drucker, 1979). Risk taking is defined as the willingness to commit

resources to opportunities and assume business risk (Miller, 1983). Pro-activeness is the ability to persevere in ensuring that the initiatives are implemented. Pro-activeness is concerned with adaptability and tolerance of failure (Lumpkin and Dess, 1996). EO dimensions (innovation, risk taking and pro-activeness) are of equal importance in explaining business performance (Raunch et al., 2011). Figure 5 depicts the dimensions of the latent construct EO.



Figure 5: The dimensions of EO

2.3.2 Innovativeness

Lumpkin and Dess, (1996, p. 142) define innovativeness as a firm's propensity "to engage in and support new ideas, novelty, experimentation and creative processes that may result in new products, services or technological processes". They classify innovation as either product-market innovation and/or technological innovation. Technological innovation entails product and process development, engineering and research (Lumpkin and Dess, 1996). On the other hand product-market innovativeness

involves product design, market research, advertising and promotion (Lumpkin and Dess, 1996). Innovativeness is an important element of how firms explore or as we argue create opportunities, thus it is a vital element of EO.

Innovativeness encourages experimentation and trial-and-error in entrepreneurial firms (Kreiser, 2011), hence facilitating the ability to combine and leverage knowledge (Anderson, Covin and Slevin, 2009; Li, Huang and Tsai, 2009) and creativity is positively related to firm-level innovation (Baron and Tang, 2010). Further, innovativeness can lead to the development of new organizational competences through the process of trial-and-error and creativity (Covin, Green and Slevin, 2006; Lumpkin and Dess, 1996). Finally, innovative firms utilize new ideas and products, as well as new technological processes, to develop new products, processes and/or markets (Covin, Green and Slevin, 2006; Lumpkin and Dess, 1996).

2.3.3 Risk Taking

Lumpkin and Dess (1996) suggest the meaning of risk is context dependant. They suggest three types of strategic risk: venturing into the unknown, committing a relatively large portion of assets and borrowing heavily. Venturing into the unknown suggests a degree of uncertainty whereas committing a relatively large portion of assets and borrowing heavily relate to financial risk taking. Lumpkin and Dess (1996, p. 145) and other scholars suggest that firms with an entrepreneurial orientation assume risks in order to “obtain high returns by seizing opportunities in the marketplace”.

We posit that the theory of effectuation elucidates how managers and/or expert entrepreneurs manage the risk taking embedded in EO. In an effectual context

successes and failures are inputs into a process that needs to be managed such that failures are outlived and successes are accumulated (Sarasvathy, 2001). Emphasizing control and managing the failures it might entail, keeping them small and quick, positively influences the costs and risks of firm strategies (Wiltbank et al., 2006). Entrepreneurs concentrate on controlling the outcomes at any given level of risk, tolerating risk as a given (Sarasvathy et al., 1998). In managing risks, expert entrepreneurs pay less attention to predictive information, worry more about making do with resources on hand to invest only what they could afford to lose, emphasize stitching together networks of partnerships and leverage contingencies.

2.3.2 Proactiveness

Proactiveness can be characterised as an initiative to anticipate and pursue new opportunities (Lumpkin and Dess, 1996). Miller and Friesen (1978) argued that the proactiveness of a firm's decisions is determined by whether it shapes the environment by initiating new products, technologies, administrative techniques or whether it just reacts. Venkatraman (1989, p. 949)) has suggested that proactiveness is exemplified by “seeking new opportunities which may or may not be related to the present line of operations, introduction of new products and brands ahead of competition, strategically eliminating operations which are in the mature or declining stages of life cycle". Further, Anderson et al. (2009) suggest EO encourages firms to undertake experimentation and exploration activities leading to new venture creation. Lastly, new combinative and exploitative knowledge is largely developed through proactive behaviours (Li et al., 2009).

Creation theory suggests opportunities are endogenously created, by the deeds of entrepreneurs exploring ways to produce new products or services (Baker and Nelson, 2005; Sarasvathy, 2001). It suggests that proactive behaviours allow firms not only to anticipate future market changes and opportunities for new market entry, but also to create them. Creation theory assumes that the entrepreneur's proactiveness is the essential source of these opportunities. In this model, entrepreneurs do not wait for exogenous shocks to form opportunities and then provide agency to those opportunities, they act (Baker and Nelson, 2005; Sarasvathy, 2001).

In effectuation theory entrepreneurial opportunities are co-created through the entrepreneurial process; demographic, regulatory and institutional changes themselves can result through entrepreneurial endeavour; and even when opportunities may originate in demographic, regulatory and technological alterations, they are said to be discoverable partly because of the entrepreneurial process that helped discover them (Sarasvathy, 2001a, 2001b). The most experienced entrepreneurs explicitly implement such a co-creation process—that is, they act and behave in ways that generate a competitive advantage (Sarasvathy, 2001a, 2001b).

The researcher suggests that the proactiveness sub-construct of EO is positively related to effectuation- that is proactive entrepreneurial firms use effectual strategies to transform or shape the environment, leading to variation, which endows the firm with a competitive advantage.

To conclude, EO is a unidimensional construct in the technology sector and thus, we have sought to conceptually link each EO dimension to effectuation. EO is a strategic

orientation- it engenders firms to be innovative, risk taking and proactive. The conceptual literature suggests effectuation could provide answers to the question: how do we innovate, take risks and be proactive? In the following paragraphs, we will review literature on the EO-performance relationship and develop hypotheses around the central question: How do entrepreneurial firms that effectuate perform?

2.4 EO and Performance

EO researchers have distinguished factors that forecast EO (Miller and Friesen, 1982; Zahra, 1991), EO's impact on various aspects of firm performance (Zahra and Covin, 1995, Wiklund, 1999, Lee, Lee, and Pennings, 2001, Wiklund and Shepherd, 2003), and the detection of variables that moderate the EO-firm performance relationship (Covin and Slevin, 1988; Lumpkin and Dess, 2001; Yusuf, 2002). However, scholars have suggested that the effect of strategy pursued on the association between a firm's EO and its performance is an under-researched topic within the EO research sphere (Lumpkin and Dess, 1996, Rauch et al., 2009, Miller, 2011).

Research on the EO-performance relationship has also investigated the role of moderators. Raunch et al. (2009) conducted a meta-analysis of 51 studies that researched the EO-performance relationship. Firstly, they found that size moderates the EO–performance relationship. Secondly, they found that high-tech firms showed a higher correlation between EO and performance than low-tech firms. Finally, they suggest that based on their meta-analysis, the "true" correlation between EO and firm performance is .242. They recommend that other studies use it as a benchmark to ask "the question whether they have been able to increase explained variance, for example,

by improving the scales of EO or by examining strategy pursued as a moderator that may affect the EO–performance relationship" (p. 781).

The EO-performance relation has also been investigated in emerging markets, with rather interesting results. Tang, Tang, Marino, Zhang and Li (2008) examined the role of entrepreneurial orientation (EO) in firm performance in a Chinese context. They argued that both the internal organizational structures and institutional environment in China are noticeably different than those in developed countries. Firstly, they suggest that a significant lack of "guanxi network, experienced management teams and organizational formalization may impede high EO from benefiting organizations and secondly, the concurrence of socialist and market-based capitalist systems, along with the fact that government controls resources, financing and materials distribution, may all promote a unique relationship between EO and performance" (p. 220). They used a two-study approach to test the link between EO and performance. Both studies found an inverted U-shaped, curve linear relationship. Whereas low-EO and high-EO firms showed poor performance, middle-level EO firms related positively to performance. They suggest that this is because low-EO firms do not attempt to compete forcefully and the lack of institutional support and organizational formalization hinders high-EO firms.

Su, Xie and Li (2011) continued along this line of inquiry. They investigated the differential impact of EO on performance in new technology ventures and established firms in China. They found that the EO–performance relation is inverse U-shaped in new ventures. However, it was positive in established firms. They argue that this is because new ventures suffer from "the liability of newness" (Freeman, Carroll, and Hannan 1983) and that established firms have "the resources, legitimacies and social

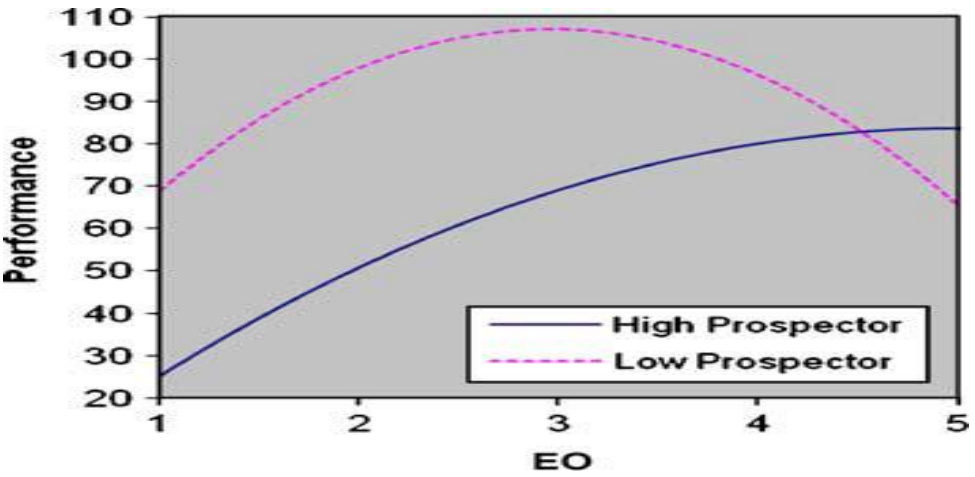
ties and role formalization" (p. 559), that new ventures lack. They posit that that the resources, legitimacies**,** social ties and role formalization all moderate the EO–performance linkage (Covin and Slevin 1991).

There is little information on the internal organisational processes that link EO to performance. However, researchers have begun to examine strategy pursued as a mediator that may affect the EO–performance relationship. Rodrigues and Raposo (2011) argue that entrepreneurial orientation interacts with market orientation to improve performance and human resources information management (HRIM) is a critical component of market orientation. They tested a structural model of relationships among entrepreneurial orientation (EO), HRIM and firm performance using a sample of small and medium sized enterprises (SMEs) from the manufacturing sector of Portugal. Firstly, they found that EO had a positive direct effect on both performance and HRIM. Secondly, HRIM also had a positive effect on firm performance and finally, EO indirectly impacted firm performance through HRIM. The authors argue that generative learning is inherently entrepreneurial and connected with knowledge acquisition through exploration, experimentation and the rapid development of new behaviours to leverage learning.

Similarly, Tang and Tang (2010) investigated whether strategy pursued moderates the inverted U-shaped relationship between EO and performance in technology firms in China. The prospector, analyser and defender typology was used to classify firms (Miles and Snow, 1978). Prospector firms are defined as firms that constantly seek new opportunities and initiate major product changes in order to lead market changes, defenders seek to refine and exploit current product lines and analysers combine both

prospector and defender strategies. Data was collected from 155 SMEs in China. Tang and Tang (2010) found that prospector and analyser strategies alleviated the curve significantly. In contrast the defender strategy enhanced the curve linearity.

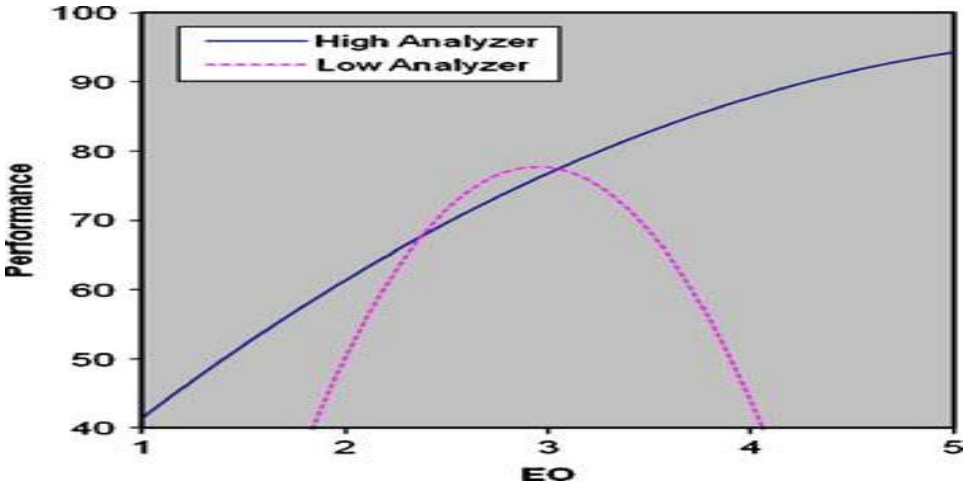
Figure 6: Performance as a function of EO and prospector strategy



Source: Tang and Tang (2010, p. 16)

Figure 6 reveals that the curvilinear relationship between EO and performance depends on if the prospector strategy is adopted. Figure 7 depicts the inverted curvilinear relationship between EO and performance when the analyser strategy is added as a moderator.

Figure 7: Performance as a function of EO and analyzer strategy



Source: Tang and Tang (2010, p. 16)

The EO-performance curve is moderated such that performance improvements are observed when EO increases from moderate to high levels.

Whether casual strategy pursued is a moderator that may affect the EO–performance relationship was examined by Harms, Reschke, Kraus and Fink (2010). They conducted a study on the performance implications of goal-oriented management techniques (GoM) such as management by objectives (MbO) on innovation and growth in the context of EO. A sample of 165 fast growth technology-based ventures from Germany was surveyed. The results suggest that EO has a positive impact on innovation and growth, with innovation being a partial moderator. Further, EO seems to be negatively related to the degree to which GoM is used, while GoM itself has a negative relationship with innovation. For technology-oriented SMEs, innovation and growth are important aspects of firm performance and a strategic orientation that emphasises entrepreneurial behaviour may be an effective way to obtain these goals (Harms et al., 2010). Since,

effectuation is the antithesis of casual strategies such as GoM, prospector and analyser strategies are experimental and lastly, generative learning and social networking are important elements of the effectual process, we propose that effectuation moderates the EO-performance relationship, i.e. firms that use effectuation as display EO behaviour are likely to perform better.

EO exhibits a comparable relation between perceived financial performance, perceived nonfinancial indicators of performance, and archival performance (Rauch et al., 2009). Rauch et al. (2009) suggest that the EO-performance relationship remains vigorous to modifications in performance dimensions and "common method variance, memory decay or social desirability concomitant with self-reporting of performance does not generally constitute a peril to the validity of the EO-performance relationship" (p. 780). In closing, the use of perceived financial performance would not compromise the legitimacy of this study.

2.5 Performance

2.5.1 Theoretical Background on Determinants of Firm Performance

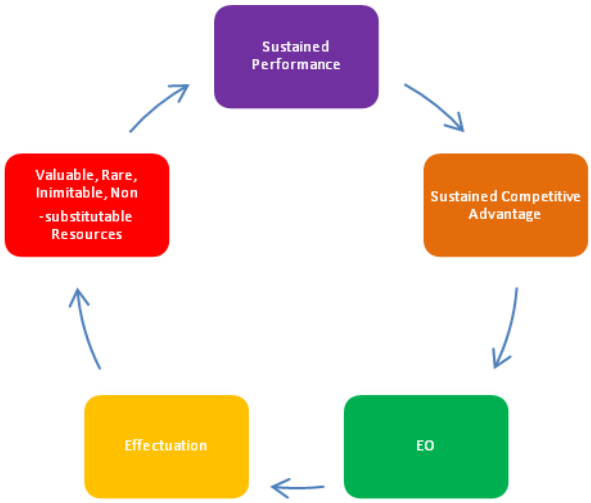
In this section we review the literature on firm performance. We initially explicate the Resource Based View and then address empirical studies on firm performance, the measurement of firm performance and control and moderator variables. The resource based view and the measurement of firm performance are reviewed in the following section.

2.5.2 Resource-based View of the Firm

The firm is a collection of productive resources (physical and human), the allocation of which among different functions and over time is decided by administrative action (Penrose, 1959). Building on Penrose's (1959) research Wernerfelt (1984) characterized a firm's resources as tangible and intangible assets that belong to the firm. Barney (1991) emphasizes the importance of information, learning and knowledge generated from the process of enacting an opportunity. Firms that own resources that are valuable and rare attain a competitive advantage and enjoy improved performance in the short term and to sustain these advantages over time the firm's resources must also be inimitable and non-substitutable (Barney, 1991).

Effectuation helps explicate how, as Miller and Friesen (1978) and Vankataraman (1997) suggested, firms proactively shape the environment and- "by accumulating stakeholder commitments under goal ambiguity, achieving control through non-predictive strategies and using exaptive orientation, potentially create a broader and different range of variation" (Dew et al., 2008, p. 38). As that process evolves differently for different entrepreneurs, the opportunities that result may be heterogeneous in "costly-to-copy, and costly-to-reverse" ways (Barney, 1991, p. 106), thus creating a competitive advantage. Stakeholder commitments and alliances that evolve from the effectual process may be the very inimitable and non-substitutable resources that help sustain these advantages over time. In Figure 6, we adapt Barney's conceptual model to try to elucidate how effectuation and EO help firms develop and sustain a competitive advantage.

Figure 8: Creating competitive advantage



Source: Own (Adapted from Barney's (1991) conceptual model)

2.5.3 Definition of Performance

Organizational performance is an important dependant variable for strategy and entrepreneurship scholars. Entrepreneurship and strategy are assessed based on their contribution to organizational performance. Thus, measuring organizational performance is essential in enabling researchers, entrepreneurs and managers appraise the strategies they use against the objectives they seek to attain. Venkataraman and Ramanujam (1986) distinguished between three different types of performance: financial performance, operational performance and organizational performance. Richard, Devinney, Yip and Johnson (2009) suggest that organisational performance covers three specific areas of firm outcomes: financial performance, product market performance and shareholder return.

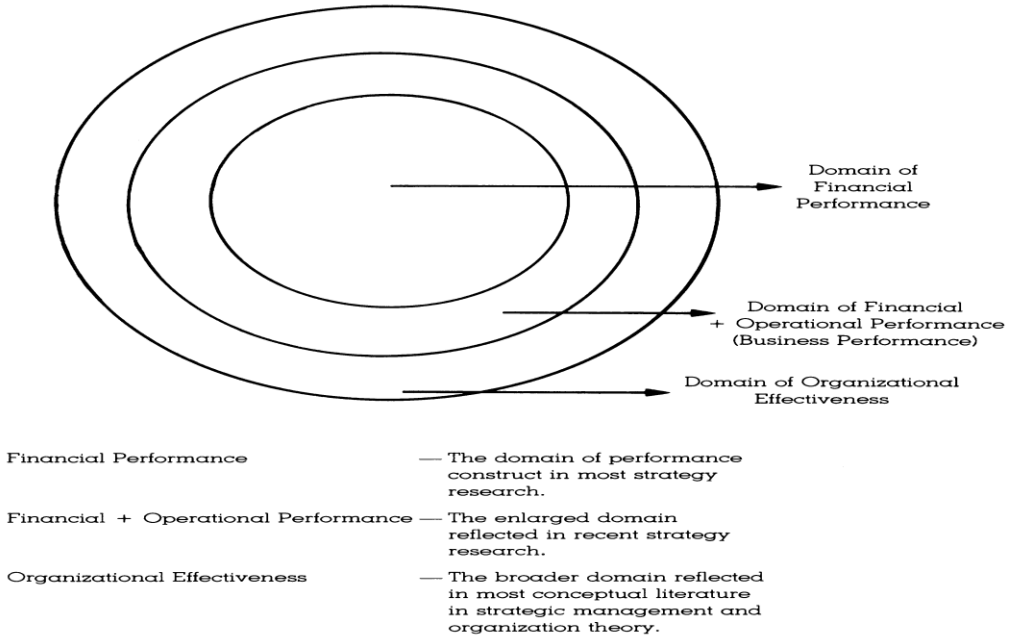
Financial performance involves the use of outcome based financial indicators that reflect the attainment of economic goals. Indicators such as sales growth, profitability, earnings per share, etc. are used to evaluate financial performance. Accounting and financial market measures are frequently used to assess organisational performance. Danielson and Press (2003) found that accounting and economic returns are associated with a correlation above 0.75. However, Venkataraman and Ramanujam (1986) argue that this approach assumes that firms prioritize financial goals. Richard et al. (2009) also caution researchers against these measures arguing that accounting measures can be rendered unreliable by differing accounting policies, human error and deception.

Financial market measures, predominantly shareholder return, have also been employed in strategy and entrepreneurship literature to evaluate organizational performance. They represent the discounted present value of future cash flows and also reflect intangible assets more effectively than accounting data (Richard et al., 2009). However, Richard et al. (2009) warn that instead of reflecting future cash flows, stock market returns are often attributable to financial market volatility, momentum and herding behaviour. Further, market returns are less useful for assessing the performance for a product, unlisted firms or a strategic business unit.

Operational performance includes broader business performance measures. Measures such as market share, customer satisfaction, product quality and manufacturing efficiency are included in the definition of business performance. Venkataraman and Ramanujam (1986) argue that the inclusion of operational performance measures is useful since it accounts for operational success factors that might lead to financial performance.

Organizational effectiveness is a broader construct. It entails organizational performance in addition to numerous internal performance measures usually connected to efficient operations and other measures that include broader stakeholders such as corporate social responsibility (Richard, Devinney, Yip and Johnson, 2009). Figure 9 illustrates Venkataraman and Ramanujam (1986) conceptual model of the three domains of business performance.

Figure 9: The Domains of Business Performance



Source: Venkatraman and Ramanujam (1986, p. 803)

2.5.4 Control and Moderator Variables

According to Raunch et al. (2009), there is a lack of research on control and moderator variables in strategy and entrepreneurship literature. This may be ascribed to the fact that control variables used in some studies may be used as explanatory variables in others. Frequently used control variables are firm size, industry type and firm age

(Raunch et al. 2009). Among moderator variables environmental turbulence, strategy pursued and incentive and control systems used internally within the firm have been employed as moderators of performance (Raunch et al, 2009).

2.5.5 Time Frame of Performance Measurement

The time frame of a firm's performance refers to the time horizon over which performance is measured. Katsikeas, Leonidou and Morgan (2000) suggest that there are three time frames: historical, current and future. Strategy and entrepreneurship literature have mainly used 3 and 5 year time frames.

Richard et al. (2009) caution against using short- or medium-term measures since they can be heavily biased by random fluctuations, performance itself does not persist indefinitely and they fail to account for the variability and stickiness in performance. Further, Powell (2003) suggests differences in performance could also be attributable to random Markov processes leading to differing performance outcomes in the absence of firm-specific heterogeneity. In addition, Richard et al. (2009) suggest that reputation effects, auto-correlation, bias arising from subjective measures and the temporal properties of accounting rates of return may imply performance persistence whereas performance persistence is partially attributable to the time series characteristics that lead to stickiness in return measures. This warns researchers against interpretation of performance differences without taking into account the temporal dimension (Richard et al., 2009).

2.5.6 Subjective Measures of Organizational Performance

Subjective measures have received growing attention due to the assessment of performance based on the triple bottom line of economic, social and environmental performance (Richard et al., 2009). Researchers use subjective measures to ask knowledgeable key informants about their perceptions of organizational performance. Subjective measures are thus suitable for modification to take into account the dimensionality of the context of interest (Richard at al., 2009). However, there is increased scope for bias due to increased error caused by imperfect human cognition (Richard et al., 2009).

Subjective self-report measures ask the informant to compare the performance of the company to that of a rival or to management expectations. They allow researchers to address latent performance constructs directly and are naturally relative (Richard et al. 2009). This relativity provides flexibility allowing researchers to target the dimensions of performance directly. However, relativity renders subjective measures erratic due to the inconsistent objectives of the informants. Respondents tend to view themselves positively, construe external criteria in their favour and rely on causal uncertainty to claim responsibility for positive performance (Richard et al., 2009).

The validity of subjective measures can be improved by collecting the self-report closer to the event of interest and by selecting knowledgeable informants (Richard et al., 2009). Guthrie (2001) found a correlation 0.81 between subjective and objective measures achieved using more specific subjective constructs. The measures were also found to display strong construct validity (Wall et al., 2004). Richard et al. (2009) argue

that subjective measures can help scholars fully assess the multidimensionality of performance. Further, they assist researchers assess performance when no objective financial market or accounting measures exist such as amongst unlisted firms and/or strategic business units. However, there is limited convergence amongst researchers on the definition of performance and/or its dimensions and this has produced wide variation in the calibration of models used (Richard et al., 2009).

2.5.7 Innovative Performance

Innovative performance is composed of three dimensions: inventive performance, technological performance and commercialisation (Hagedoorn and Cloodt, 2003). Hagedoorn and Cloodt (2003, p. 1366) suggest inventive performance can be characterized as "the achievements of companies in terms of ideas, sketches, models of new devices, products, processes and systems". Inventive performance is often assessed by summing patents and patent citations. Hagedoorn and Cloodt (2003, p. 1367) define technological performance "as the accomplishment of companies with regard to the combination of their R&D input, as an indicator of their research capabilities, and their R&D output in terms of patents". Commercialisation refers to the level of new product introduction. An all-encompassing comprehension of the innovative performance of firms incorporates "their research input, the size of their inventive activities, the quality of their inventive output and their level of new product introduction" (Hagedoorn and Cloodt, 2003, p. 1367).

Innovative performance is deemed crucial to organizational success. Kim and Maubourgne (2005) submit that firms need to innovate in order to endure and flourish in

global markets. Schumpeter (1934) contends that innovative performance bestows monopoly rents and spawns enduring entrepreneurial success. The launch of new innovative products, services and/or markets distinguishes entrepreneurial firms from competitors (Porter, 1980). Innovative entrepreneurial firms differentiate themselves from competitors, enjoy higher customer loyalty and can secure superior pricing for their products (Porter, 1980). Further, through innovative performance entry barriers for prospective challengers can be erected and the firm's position in the industry strengthened leading to continual high profits (Porter, 1980). Nevertheless, other scholars question the supposed benefits of innovative performance since innovation necessitates considerable means (Van de Ven, 1986), enhances uncertainty and threats (Eisenhardt and Martin, 2000), is laden with elevated failure rates (Berggren and Nacher, 2001) and implies short-term losses (Block and MacMillan, 1993).

2.6 Environmental hostility

Environmental characteristics activate technology and entrepreneurial choices (Urban and Barreira, 2010). The entrepreneur's perception of the external environment moderates the relationship between EO and performance (Urban and Barreira, 2010). Environmental Hostility (EH) refers to an unfavourable business climate. A hostile environment is characterised by many competitors, unfavourable supply conditions and strict regulation (Zahra and Bogner, 1999). Rosenbusch, Rauch and Bausch (2011) suggest environmental hostility refers to legal, political and economic constraints, low customer loyalty and severe consequences of wrong strategic decisions.

Environmental hostility can have dire consequences for firms and the strategies they pursue. Although the construct has been researched for over thirty years, literature is not conclusive on the impact of environmental hostility on firm performance. Rosenbusch, Rauch and Bausch (2011) conducted a meta-analysis on the impact of the task environment on the EO-performance relationship. They found that hostility is not related to EO and performance. Firstly, they suggest that this could be because in a hostile environment firms face competition for resources and opportunities, which decreases profit margins and limits strategic options. Access to human and financial resources is limited. Since these resources are crucial for EO, innovativeness, risk taking and proactiveness may be an inefficient response to a hostile environment. Further, they postulate that moderators may account for the different effects reported in the literature. Thus, certain groups of firms may increase their EO if hostility increases, whereas other firms decrease it. For example, non-price hostility may increase EO whereas price hostility might lead to a decrease. Finally, they note that EO in small and medium-sized enterprises is negatively related to environmental hostility whereas it is positively related to EO in large firms. They posit that this could be because large firms have more resources that can be used to pursue entrepreneurial strategies, even in hostile environments.

However, other scholars have found a positive relationship between environmental hostility and EO and performance. EO has been positively associated with environmental hostility (Zahra, 1993). Further, firms with a high EO have displayed better performance (Covin and Slevin, 1989). Finally innovation, a sub-construct of EO, has been associated with hostile environments (Miller, Droge and Toulous, 1988). In a

South African context, Urban and Barreira (2010) in a cross sectional survey found that EO is positively correlated with environmental hostility. They suggest that a plausible explanation could be that firms operating in hostile environments need to innovate to remain competitive and thus are more likely to be entrepreneurial.

Chow (2006) suggests that the relationship between environmental hostility and performance is likely to be influenced by internal organizational factors. Peng (2001, p. 105) argues that "prospecting, networking and boundary blurring" are strategies used by the most successful entrepreneurs in emerging markets to shape the environment. Baker and Nelson (2005) found evidence of firms extracting profits from seemingly invaluable resources in low growth industries. Incomplete market information and the ability of firms to recombine resources in novel ways unforeseen by competitors can increase returns to the firm (Denrell et al., 2003). Furthermore, firms adapt by transforming unique resources to create value while considering environmental contingencies (Sirmon, Hitt and Ireland, 2007). In sum, environmental hostility seems to moderate the relationship between strategies pursued and firm performance. In the next section we will review literature on emerging markets and develop hypotheses.

2.6.1 Emerging markets

Emerging markets are characterised by environmental turbulence (Peng, 2002), less developed or more expensive external factor markets (Uhlenbruck et al., 2003) and hostile institutional influences (Peng, 2001). Despite its complication and volatility, environmental turbulence stimulates entrepreneurial endeavour in emerging markets (Peng, 2001). Dynamic, harsh and multifaceted environments encourage an

entrepreneurial orientation amongst firms (Peng, 2001). In addition, high-technology ventures are normally regarded as more entrepreneurial; especially an emerging market context because the environment is more risky and uncertain and competitive advantages come from innovative and proactive orientation (Peng, 2001).

Support for entrepreneurial firms in emerging markets remains weak (Peng, 2001). They are grudgingly accepted or face antagonism from large segments of the population (Peng, 2000). Thus, cultural differences have an impact on entrepreneurial high technology firms (Peng, 2000). High-technology entrepreneurial firms often employ guerrilla strategies in order to successfully navigate the contextual constraints and mitigate the negative performance implications of entrepreneurial activities in often-hostile institutional environments (Peng, 2001). The weak regulatory environment, which consists of laws, regulations and codified government policies, is often hostile to change (Peng, 2000). Bruton, Ahlstrom and Obloj (2008) argue that hostile institutional and cultural forces do not only constrain entrepreneurial firms, but they also enable them. Further, those entrepreneurs that can understand and make the most of the local institutional regime, form business systems that are distinctive and act to shape their institutional environments will succeed. Should they fail to do so “they ultimately may be overwhelmed by what often proves to be a hostile environment bent on extracting as many resources as possible” (Ahlstrom and Bruton, 2002, p. 54).

The importance of institutional influences and environmental hostility on business strategies is increasingly recognised in an emerging market context (Peng, 2002). As noted in the preceding paragraphs, Peng (2001, p. 105) has argued that “prospecting, networking and boundary blurring” are strategies used by the most successful

entrepreneurs in emerging markets to mitigate environmental hostility. Although these strategies are also used in developed markets, they are particularly important in transition economies since substitute strategies such as buy outs are not easily available (Lau and Bruton, 2011).

In an emerging market context, networking has been deemed important in ameliorating some of the hostile institutional and cultural practises (Lau and Bruton, 2011). Further, networking is deemed important in the success of technology ventures in transition economy contexts (Peng and Luo, 2000). Lau and Bruton (2011) have found that the entrepreneurial firms' social network directly influences sales performance. In addition, Peng and Luo, (2000) suggest that social networks of the high-technology venture affect firm performance, since networking is a key intangible asset in a transition economy. They posit that social networks positively influence the effect of entrepreneurial strategies by providing resources that are critical to the firm.

The researcher contends that effectuation provides a possible explanation of the behaviour of entrepreneurial firms in hostile environments since in such hostile environments the use of non-predictive strategy can be beneficial to entrepreneurial firms (Witlbank et al., 2009). Thus rather than trying to predict an uncertain environment, they seek to control it. Instead of trying to work within hostile institutional and cultural environments, they transform them. They achieve these ends by boundary blurring, accumulating stakeholder commitments under goal ambiguity, achieving control through non-predictive strategies and using exaptive orientation, to create a broader and different range of variation (Dew et al., 2008). It is this very variation that may lead to a competitive advantage.

Further, in such environments entrepreneurial firms do not worry about the resources they need, rather they focus on the resources they have (Sarasvathy, 2001). They begin with who they are, what they know and whom they know to envisage artefacts they can create (Sarasvathy, 2001). Resources are then secured from the environment through self-selecting stakeholders. Opportunities are constructed through collaboration and goal creation with others and each effectual stakeholder invests what they can afford to lose; and environmental contingencies are leveraged (Sarasvathy, 2001). Thus means, social networking, leveraging environmental contingencies and active boundary blurring are used to transform hostile environments and build successful firms/markets. In sum, expert entrepreneurs utilise effectuation to transform hostile environments and as a result create a multiplicity of new and profitable ends (Venkataraman and Sarasvathy, 2001).

Conclusion of Literature Review

In conclusion, non-predictive strategy pursued is the focal area of this research. For entrepreneurial firms, an effectual strategy development process can be decidedly appropriate. Whereas predictive strategies are ways to manipulate current realities to reach preselected goals; effectual strategies generate new goals and new environments from current realities. The utility of emphasising prediction and/or adapting to exogenously given circumstances is questionable in conditions of high uncertainty. Whether an effectual or predictive strategy is optimal and in what context, has not been resolved in literature.

Testing the moderating impact of effectuation on the relation between EO and performance requires a methodology that allows us to test for correlation and causation between the variables. Thus, due to the confirmatory nature of our research, a quantitative approach using factor analysis and regression analysis is the most appropriate. Exploratory factor analysis facilitates ascertaining construct and discriminant validity and multiple regression assists us in the testing of causal relationships between variables (Hair et al., 2010). Thus, regression analysis will be used to test whether effectuation moderates the relation between EO and performance and whether environmental hostility moderates the relation between effectuation and performance in South African firms. The hypothesis are summarised below:

H1: EO positively predicts effectuation.

H1a: EO positively predicts experimentation.

H1b: EO positively predicts flexibility.

H2: Hostility positively predicts effectuation.

H3: EO positively predicts performance.

H3a: EO positively predicts financial performance.

H3b: EO positively predicts market performance.

H3c: EO positively predicts innovative performance.

H4: Effectuation positively predicts performance.

H4a: Effectuation positively predicts financial performance.

H4b: Effectuation positively predicts market performance.

H4c: Effectuation positively predicts innovative performance.

H5: Flexibility positively predicts performance.

H5a: Flexibility positively predicts financial performance.

H5b: Flexibility positively predicts market performance.

H5c: Flexibility positively predicts innovative performance.

H6: Experimentation positively predicts performance.

H6a: Experimentation positively predicts financial performance.

H6b: Experimentation positively predicts market performance.

H6c: Experimentation positively predicts innovative performance.

H7: Affordable loss positively predicts performance.

H7a: Affordable loss positively predicts financial performance.

H7b: Affordable loss positively predicts market performance.

H7c: Affordable loss positively predicts innovative performance.

H8: Pre- commitments positively predict performance.

H8a: Pre-commitments positively predicts financial performance.

H8b: Pre-commitments positively predicts market performance.

H8c: Pre-commitments positively predicts innovative performance.

H9: Environmental hostility moderates the relation between effectuation and performance.

H9a: Environmental hostility moderates the relation between experimentation and performance.

H9b: Environmental hostility moderates the relation between experimentation and performance.

Figures 9 and 10 illustrate the moderation hypotheses.

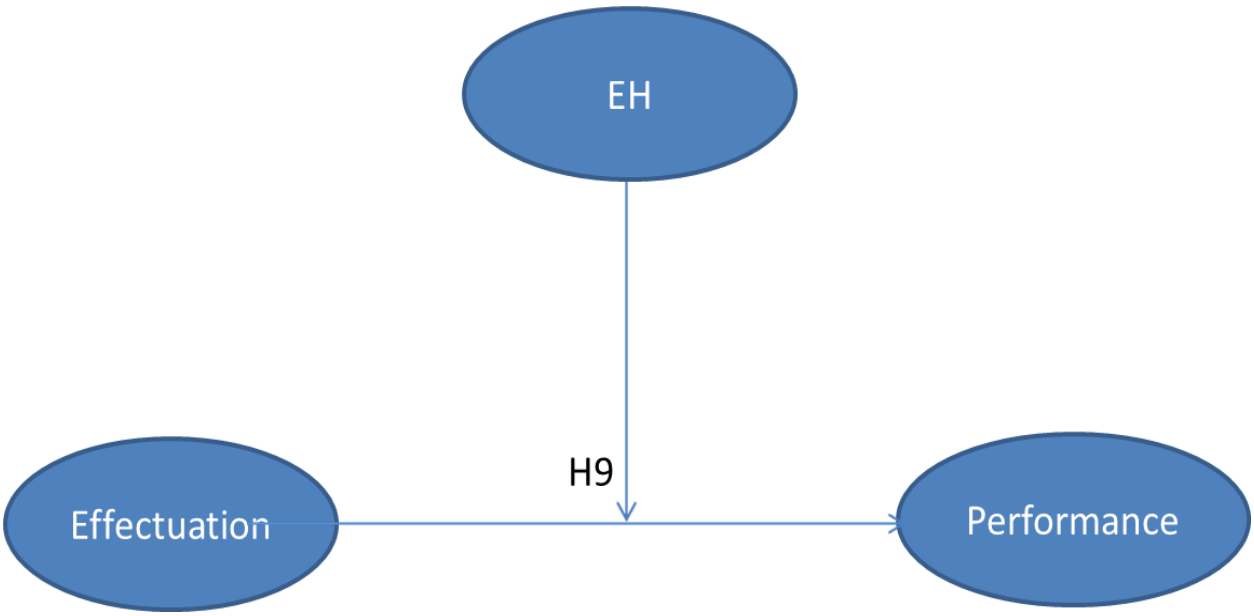


Figure 10: Hostility as a moderator of Effectuation and Performance

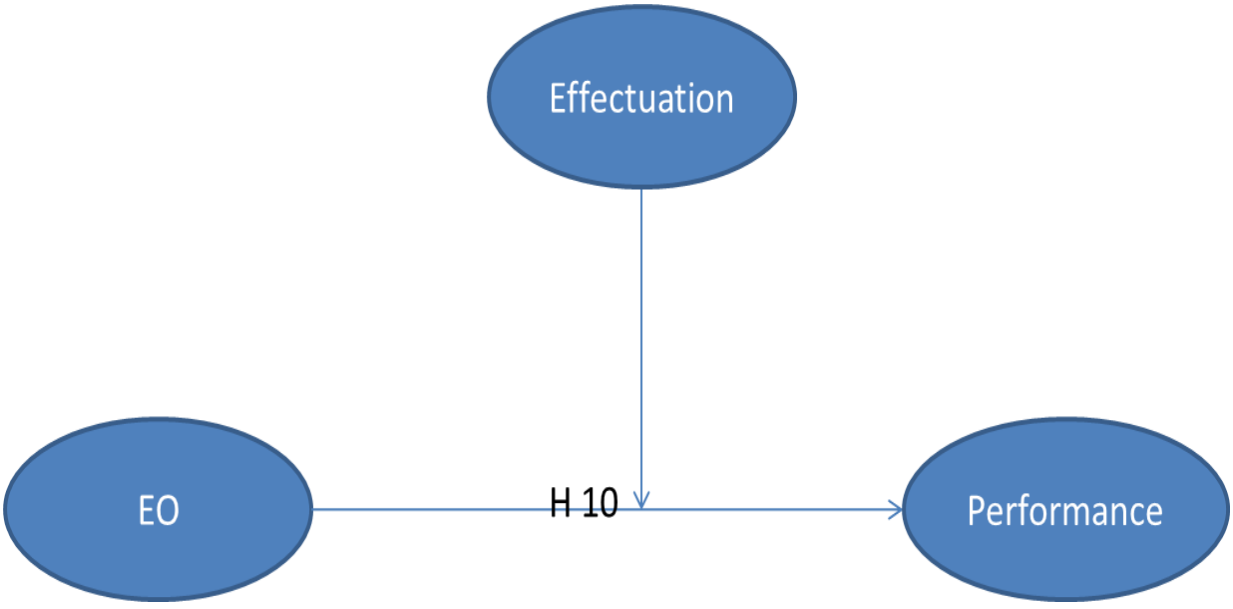


Figure 11: Effectuation as a moderator of EO and Performance

H10: Effectuation moderates the relation between EO and performance.

H10a: Experimentation moderates the relation between EO and performance.

H10b: Affordable loss moderates the relation between EO and performance.

H10c: Flexibility moderates the relation between EO and performance.

H10d: Precommitments moderates the relation between EO and performance.

Chapter 3: Research Methodology

3.1 Research methodology

This section outlines the methodology used to conduct this research. Firstly, the literature around quantitative research will be discussed, followed by a review of the research design and research instrument to be used. Issues of data collection and analysis in relation to this study will be provided, followed by a discussion on the validity and reliability.

3.1.1 Research methodology / paradigm

This study will adopt a positivist approach to research. Positivist social science is an organised method for combining deductive logic with precise empirical observations of individual behaviour in order to discover and confirm a set of probabilistic casual laws that can be used to predict general patterns of human activity (Neuman, 2003). The positivist approach uses scientific methods to study social science. Bryman and Bell (2007) note that the positivist approach is based on five principles:

- Only occurrences that are validated by the senses can be deemed knowledge.
- The objective of research is to develop theories that can be assessed.
- Understanding comes from assembling facts that are the basis for laws.
- Science must be objective.

- Assumes an objective, social reality and that the researcher is independent of the research subject.

Positivists believe in a single reality that can be measured reliably and validly using scientific principles (Onwuegbuzie and Leech, 2005). Positivists believe social science should be value free and objective (Neuman, 2003).

This study will use a quantitative research methodology in order to gather the most appropriate data to answer the hypothesis. Quantitative research refers to the systematic empirical investigation of social phenomena via statistical, mathematical or computational techniques (Onwuegbuzie and Leech, 2005). The objective of quantitative research is to develop and employ mathematical models, theories and/or hypotheses pertaining to phenomena (Onwuegbuzie and Leech, 2005).

The research objective in quantitative studies can be classified as falling on a continuum from exploratory to confirmatory (Onwuegbuzie and Leech, 2005). A quantitative research objective is exploratory if the goal of the study is to examine patterns from data collected by the investigator or the researcher (Onwuegbuzie and Leech, 2005). A quantitative research objective is confirmatory if the goal of the investigation is to use the underlying data collected to test hypotheses of interest (Onwuegbuzie and Leech, 2005).

The process of measurement is central to quantitative research because it provides the fundamental connection between empirical observation and mathematical expression of quantitative relationships (Onwuegbuzie and Leech, 2005). The data will be collected using a self-administered questionnaire, electronically solicited through Qualtrics. Self-

administered questionnaires will enable the researcher to contact Chief Executive Officers who might otherwise be inaccessible (Cooper and Schindler, 2011). They are also relatively cost effective and time efficient (Cooper and Schindler, 2011).

The researcher shall assume that respondents were honest and candid.

3.2 Research Design

A web-based survey is used to collect data for this survey. In the following section, we explicate the reasons for using a web-based survey, sample selection, survey development and the measurement of constructs. Further, the multivariate statistical techniques employed will be discussed.

The firm was selected as the most appropriate unit of analysis. The firm represents an aggregate of different individuals and business activities. Operationalization of EO and strategy formation implies measuring a senior manager's perception of his firm's strategic orientation. In sum, what is really measured is the CEO's perception and this serves as a useful proxy for measuring strategy formation (Wiklund, 1999).

Further, using the firm as a unit of analysis brings about additional complications. Size, size distributions, and heterogeneity need to be addressed (Davidsonn, 2004). Since industry dynamics differ, firm heterogeneity raises concerns about generalizability and applicability. To counteract such discrepancies the instruments will be carefully operationalized and the level of analysis will be explained in detail.

Lastly, control variables in this study will include: firm age and firm size. Control variables are variables that might affect a given relationship but their effect is not at the

core of the problem that is under investigation (Cooper and Schindler, 2011). Measuring the direct effect of the environment will partially account for other factors that may moderate between the constructs.

3.2.1 Population and sample

The population of interest will be registered high technology firms in South Africa. Other regions are not considered due to financial constraints. A comparison with other markets would enrich the study.

3.2.2 Sample and Sampling method

The researcher used a non-probability sampling technique called judgement sampling. Judgement sampling occurs when a researcher selects sample members to conform to some criterion. When judgement sampling is used, there is greater risk of bias in the sample which could distort the results of the study and similar to other non-probability sampling techniques, the probability of selecting population elements is not known (Cooper and Schindler, 2011).

The Technology Top 100, the department of Trade and Industry (DTI) and IT Web databases were used to develop the sampling frame for this research. It is important to note that both high technology and traditional firms were incorporated in the sampling frame. Comparing between these two types of firms is likely to lead to more robust results and offers a more integrated perspective on the determinants and measurement of performance of high technology firms, relative to traditional firms.

To assess high technology firms, respondents we asked to describe their firms as:

- Low tech
- Medium tech
- High tech.

Secondly, an industry classification code developed by Kile and Phillips (2009) was used**.** Kile and Phillips (2009) developed a set of eleven standard industrial classification codes (SIC) that provide a preferred sampling combination for high technology firms with a 94% accuracy rate, leading to a 6% Type II error rate. They suggest that this classification method has the potential to generate samples containing more high-tech firms, thus enabling more powerful statistical tests.

Multiple regression analysis was utilised to analyse our data. Hair, Black, Babin and Anderson (2010) suggest that to produce stable solutions that are more likely to be replicable, when using multiple regression analysis, sample size decisions need to be made based on model complexity and basic measurement model characteristics. They suggest a minimum sample size of 50 to improve generalizability, obtain adequate power and address model parsimony.

3.3 The research instrument

The research instrument is a self-administered questionnaire. A self-administered questionnaire is relatively cost effective and facilitates sample accessibility (Cooper and Schindler, 2011). A web-based survey is used as the research instrument. A web base survey facilitates access to a bigger geographic sample and an improved response

speed (Cooper and Schindler, 2011). Further, reduced coverage bias is likely as most managers of have access to the internet and regularly use e-mail (Cooper and Schindler, 2011).

The computer software Qualtrics was selected to create a web based survey instrument. Qualtrics is a professional survey instrument licensed by the University of the Witwatersrand. The University endorsement further enhanced the credibility of the study amongst respondents. The questionnaire consisted of five sections, namely:

- Demographic
- Effectuation
- EO
- Environmental Hostility
- Performance

Likert scales were used for the questions covering the constructs. The participants were asked whether they agree or disagree toward the question of interest, using a 7-point Likert scale. Likert scales are commonly used in social science, strategy and entrepreneurship research and help facilitate statistical analysis (Cooper and Schindler, 2011). The layout and design of the survey included page breaks and forced response where applicable. To increase validity, the survey was thoroughly checked by the author's supervisor and his research assistant (Merle Werbeloff). Further, the instrument was pre-tested on 5 MBA students. MBA students are good proxies for

senior managers since they are aware of the subject of interest. Minor amendments were made to wording, the order of questions and spelling errors, based on the feedback received from the pre-test.

3.3.1 Measurements of Constructs

In order to test the hypothesis outlined in Chapter 2, measurements were adapted from previously validated measures found in entrepreneurship literature. These scales were assessed for validity and construct reliability. The variables were measured using seven-point Likert scales.

Firstly, EO was measured based on Miller's (1983) conceptualization of EO, using items recommended by Covin and Slevin (1989). The scale comprises of nine items (Covin and Slevin, 1989; Messeghem, 2003; Miles and Arnold, 1991; Naman and Slevin,

1993; Zahra, 1991; Zahra and Covin, 1995), measuring innovativeness, pro-activeness and risk taking.

Secondly, the five items from Powell (1995) for the measurement of firm performance, covering financial performance, sales growth, profitability and revenue growth were adapted. The researcher also used an item for relative market share proposed by Baker and Sinkula (1999). Further, items to measure innovative performance were added.

To operationalize environmental hostility an instrument developed by Urban and Barreira (2010) was employed. Confirmatory factor analysis showed that the set of responses were valid and reliable.

Finally, to measure effectuation a validated scale developed by (Chandler et al., 2011) was adapted. Confirmatory factor analysis showed that the set of responses worked together statistically, and exploratory factor analysis showed that effectuation is a formative multidimensional construct with four associated sub-dimensions: experimentation, affordable loss, pre-commitments and flexibility (Chandler et al., 2011). Table 4 illustrates a detailed overview of the measurement of the constructs. The variables were measured using seven-point Likert scales.

Table 3: Summary of Measurement for Explanatory Variables

Construct	Measurement	Sources
Effectuation	13 items, 7-point Likert scales Experimentation Affordable loss Flexibility Precommitments	Chandler et al. (2011)
EO	9 items, 7-point Likert scales Innovativeness Risk Taking Pro-activeness	Covin and Slevin (1989)
Environmental Hostility	6 items, 7-point Likert scales	Urban and Barreiro (2010)
Performance	12 items, 7-point Likert scales Financial performance Market/Operational performance Innovative performance	Powell (1995), Baker and Sinful (1999).

3.3.3 Procedure for data collection

Surveys were sent through Qualtrics to 500 firms in South Africa, taking into consideration the geographical diffusion of sample firms. The questionnaire was easy to read and offered clear response directions (Cooper and Schindler, 2011). Each firm received a covering e-mail with the university logo, which described the research and

asked for their participation. University endorsement tends to lend more credibility to research requests, helping to increase response rates (Schneider and Johnson, 1995).

The initial e-mail contained the link to the web-based survey and assured the targets that the survey is anonymous. The anonymity of responses, stated in the covering e-mail, helps to increase response rates (Cooper and Schindler, 2011). Electronic reminders, containing the survey link, were sent one week after the initial e-mail. According to Cooper and Schindler (2011) questionnaires that are easy to read, have reminders after the delivery of a self-administered survey and that give clear response directions improve response rates. The web-based survey instrument is presented in Appendix B, along with the initial postal cover letter (Appendix A).

The questionnaires were addressed to the CEO, Managing director and/or senior executives. Proper instructions were given to this effect.

3.3.4 Data analysis and interpretation

Exploratory data analysis (EDA) involved the calculation of descriptive statistics and frequencies to search for clues and patterns in the data (Cooper and Schindler, 2011). EDA supports traditional statistics. Numerical summaries of location, shape and spread were calculated. Further, graphical displays were used to provide an accurate description of distributions and variable relationship (Cooper and Schindler, 2011). Frequency tables were used to arrange data from the highest to the lowest with counts and percentages. Bar charts and pie charts helped with relative comparisons of nominal data (Cooper and Schindler, 2011).

Multiple regression analysis was used as the main statistical tool to test the hypotheses. Multiple regression analysis can describe the relationships among two or more intervally scaled variables (Hair et al., 2010). Multiple regression analysis is appropriate for analyzing the degree and character of relationships of a single dependent variable (DV) and several independent variables (IV) (Hair et al., 2010). The objective of multiple regression analysis is to use the several IVs to predict the single DV (Hair et al., 2010).

To measure predictive accuracy, when using multiple regression analysis, one squares each error and adds the results together (Hair et al., 2010). This is referred to as the sum of squared errors (SSE) which provides a measure of predictive accuracy that varies based on the amount of prediction error (Hair et al., 2010). One wishes to obtain the lowest amount of SSE. This is referred to as the concept of ordinary least squares (Hair et al., 2010).

Multiple regression analysis assumes (Hair et al., 2010):

- The linearity of the phenomenon measured
- Constant variance of error terms
- Independence of error terms
- And normality of error term distribution

Residuals were plotted against predicted variables to identify potential violations of the regression assumptions (Hair et al., 2010). Multicollinearity among the IVs was assessed using pairwise correlation (Hair et al., 2010). The various measures of

performance were used as the DV with the objective of understanding how EO and effectuation and their sub-constructs explain the distinct aspects of performance. Effectuation was also used in some regressions as a DV with the purpose of understanding how environmental characteristics and strategic orientations explain effectuation.

Moderation occurs when a third construct changes the relationship between two related constructs (Hair et al., 2010). The moderator variable changes the form of the relationship between another independent variable and the dependent variable (Hair et al., 2010). We assessed whether effectuation and its sub-constructs moderated the relationship between EO and the various dimensions of performance. Environmental hostility was also assessed as a moderator of the relationship between effectuation and the various dimensions of performance. As Hair et al. (2010) suggest we a three step process was followed to determine whether the moderator effect was significant:

- Estimated the original un-moderated equation
- Estimated the moderated relationship
- Assess the change in R2. If the incremental effect is significant then a significant moderator effect is present.

Further, two independent sample t-tests were used to compare whether there were significant differences in the strategy pursued by high technology firms and medium and low technology firms and the resulting performance outcomes.

All testing was done using 90%, 95% and 99% confidence level. The statistical software Statistica was used for the quantitative analyses in the study.

3.4 Limitations of the study

The limitations are comprehensively dealt with in Chapter 6. In this section the researcher merely summarises the important ones. Studies on EO apply only to surviving firms. This could compromise the results due to survivor bias. Further, the causal direction between EO and performance cannot be addressed. The study cannot test the effect of EO on performance in a strict sense because cross-sectional data was used.

3.5 Validity and reliability

3.5.1 Validity

Validity relates to the ability of the research instrument to measure what it is purported to measure (Cooper and Schindler, 2011). Internal validity is assessed through assessing construct validity. Construct validity is the extent to which a set of measured items (questionnaire item) reflect the latent theoretical constructs (e.g. EO) those items are designed to measure (Hair et al., 2010). Construct validity is made up of convergent validity, discriminant validity, face validity and nomological validity (Hair et al., 2010).

Convergent validity helps assess whether the indicators of a specific construct share a high proportion of variance in common (Hair et al., 2010). The researcher assessed the correlations amongst the sub-constructs with the construct. Correlations were satisfactory, thus establishing convergent validity.

Discriminant validity is the degree to which a construct truly differs from others (Hair et al., 2010). High discriminant validity evaluates whether a construct is distinctive and describes phenomena that others do not and whether its summated scale is correlated with a similar but conceptually distinct measure. The correlation between the two measures should be low, to demonstrate that the two concepts are distinct. The researcher assessed effectuation, environmental hostility and EO for discriminant validity.

Face/Content validity gauges whether every item's content or meaning on the questionnaire adequately represents the constructs under study (Cooper and Schindler, 2011). Judgement and evaluation by the author's supervisor and his assistant were employed to ensure that our questionnaire has face validity (Cooper and Schindler, 2011).

Nomological validity assess whether correlations among constructs make sense (Hair et al., 2010). The matrix of construct correlations was used to make this assessment. Further, unidimensionality was assessed through exploratory factor analysis. The test of unidimensionality is that each summated scale should consist of items loading highly on a single factor. As Hair et al. (2010) suggests factor loadings> .5 were considered significant. Lastly, the multitrait, multimethod matrices (MTMM) were also used to assess validity.

3.5.2 Reliability

Reliability relates to the degree to which a measure supplies results consistently (Cooper and Schindler, 2011). As Hair et al. (2010) suggests the researcher used the following reliability measures:

- Cronbasch's Alpha> .7
- Item-to-total correlations> .5
- Inter item correlations>.3

High construct reliability indicates that questionnaire items consistently represent the same latent construct (Hair et al., 2010).

Chapter 4: Results

4.1 Descriptive statistics

4.1.1 Description of respondents

Questionnaires were distributed to South African companies via email containing the web link to the survey on Qualtrics. Of the 500 emails sent, 100 surveys were returned. This corresponds to a total response rate of 20%. Six of the questionnaires had only demographic information and they were deleted. The usable response rate achieved was 18.8% (94 companies). Hair et al. (2010) suggest a minimum sample size of 50 when using multiple regression analysis. Further, Arrindel and van der Ende (1985) argue sample sizes of less than 100 can produce stable factors when using exploratory factor analysis. They used two large data sets to investigate the minimum sample sizes and ratios and found stable factor structures with ratios as low as 1.3:1. Therefore, the sample size of 94 is sufficient to conduct exploratory factor analysis, maintain adequate power and undertake statistical analyses and modeling.

Table 4: Descriptive Statistics

	Valid N	Mean	Confidence - - 95.000%	Confidence - 95.000%	Median	Minimum	Maximum	Lower - Quartile	Upper - Quartile	Std.Dev.
Effectuation	94.00	5.12	4.96	5.28	5.17	2.92	7.00	4.58	5.58	0.79
EO	94.00	4.52	4.33	4.71	4.61	2.11	6.78	4.00	5.11	0.93
Performance	90.00	4.49	4.30	4.69	4.50	1.55	6.27	4.00	5.09	0.92
Hostility	88.00	4.71	4.48	4.94	4.80	1.60	6.60	4.20	5.60	1.09

Missing data are information from a participant that is not available for one or more variables of interest (Cooper and Schindler, 2011). In the survey, 4 respondents did not

complete the performance variables and an additional 2 did not complete the environmental hostility variables. The researcher used list wise deletion- a technique that deletes cases with missing data on one variable from the sample for all analyses of that variable- to salvage the data set (Cooper and Schindler, 2011). With this technique, no bias is introduced to the sample because only fully complete cases are used for the variable.

Table 4 presents the descriptive statistics for effectuation, EO, performance and environmental hostility. The mean and the median are similar for all constructs, indicating the absence of skewness. Effectuation has the highest mean at 5.12, whereas environmental hostility has the highest standard deviation. The standard deviation helps us calculate with a 95% level of confidence where the sample mean lies. For example, for the construct effectuation one is 95% confident that the sample mean lies between 4.96 and 5.28.

4.1.2 Respondents

The survey instrument was addressed to senior company executives who are assumed to be aware of company strategy. As table 5 illustrates, 98% of the respondents were senior executives, further ensuring validity. Richard et al. (2009) argues that the validity of subjective measures can be improved by selecting knowledgeable informants. Two of the respondents indicated that they were a Project administrator and a Supervisor. These were deemed to be senior enough for the respondents to be aware of company strategy and the cases were not deleted.

Table 5: Frequency table: Current position in the firm

	Count	Cumulative - Count	Percent	Cumulative - Percent
Director	23.00	23.00	24.47	24.47
Manager	30.00	53.00	31.91	56.38
General Manager	2.00	55.00	2.13	58.51
CEO	28.00	83.00	29.79	88.30
Executive	1.00	84.00	1.06	89.36
Executive Manager	1.00	85.00	1.06	90.43
CIO	1.00	86.00	1.06	91.49
MD	1.00	87.00	1.06	92.55
CFO	1.00	88.00	1.06	93.62
Chairman	1.00	89.00	1.06	94.68
Supervisor	1.00	90.00	1.06	95.74
Project Administrator	1.00	91.00	1.06	96.81
Sales Executive	1.00	92.00	1.06	97.87
Managing Director	1.00	93.00	1.06	98.94
Managing Member	1.00	94.00	1.06	100.00
Missing	0.00	94.00	0.00	100.00

4.1.3 Firm Age and Size

The majority of the respondents (95.7%) were formed before 2008. There were only 4 firms that were three years old or younger and as a result firm age could not be used as a control variable. Similarly, firm size was not used as a control variable since only 23 of the respondents had fewer than 51 employees. As illustrated in table 6 and table 7, firm age and firm size, where over 44% of the responding firms employ more than 350 people, indicate that the respondents are a mixture of small, medium and large companies that have been in business for a substantial period of time.

Table 6: Frequency table: Firm founded

	Count	Cumulative - Count	Percent	Cumulative - Percent
Before 1950	24	24	25.53	25.53
1991-2008	27	51	28.72	54.25
1951-1990	39	90	41.49	95.7
after 2008	4	94	4.26	100
Missing	0	94	0	100

Table 7: Frequency table: Overall number of employees in the firm

	Count	Cumulative - Count	Percent	Cumulative - Percent
fewer than 51	23	23	24.46809	24.4681
51-200	23	46	24.46809	48.9362
201-350	6	52	6.38298	55.3191
351-500	10	62	10.6383	65.9574
>500	32	94	34.04255	100
Missing	0	94	0	100

4.1.4 Technological advancement

The respondents were asked to rate their company's level of technological advancement. This self reporting together with standard industrial classification codes (SIC) developed by Kile and Phillips (2009) were used to classify high technology companies. As figure 12 illustrates, seven of the respondents indicated that their firm was low tech, 54 catergorised their firm as meduim tech and 34 reported their firm as high tech. As will be discussed in the following section, t-tests were conducted to

determine where there was a significant difference in strategy and performance between high tech and meduim tech. Low tech firms, with a count of 7, were ignored.

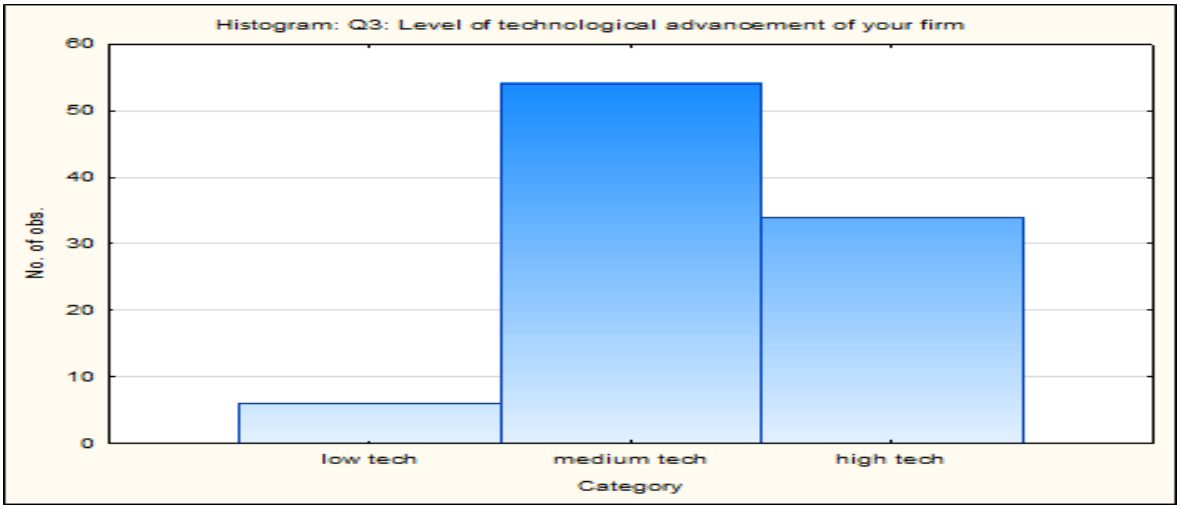


Figure 12: Level of technological advancement

4.2 Measurement aspects of the model EO

4.2.1 Measurements of Constructs

As discussed in Chapter 3, the measurements were adapted from existing scales in strategy and entrepreneurship literature. The variables and their psychometric properties are discussed in detail in this Chapter. Please refer to Tables 8 to 11 for a detailed description of the variables. The reader is advised to refer to these tables to better comprehend the sections on validity and reliability. All the variables were measured using seven-point Likert scales and thus the data is interval.

Table 8: Effectuation scale

Construct: Effectuation Scale: 7 point Likert scale

Variable	N	Mean	Std. Dev
Q6: The product/service that my company now provides is essentially the same as originally conceptualised	94	3.07	1.86
Q7: My company has experimented with different products and/or business models	94	5.61	1.30
Q8: When launching a new product or service, my company tries a number of different approaches	94	5.10	1.57
Q9: The product/service that my company now provides is substantially different than we first imagined	94	3.86	1.88
Q10: When launching a new product/service, my company is careful to invest only the resources we can afford to lose	94	4.35	1.74
Q11: When launching a new product/service, my company is careful not to risk more money than we are willing to lose with our initial idea.	94	4.87	1.60
Q12: When launching a new product/service, we are careful to invest only so much money that the company w	94	5.71	1.31
Q13: My company allows the business to evolve as opportunities emerge .	94	5.80	1.21
Q14: My company has adapted what we are doing to the resources we have	94	5.09	1.70
Q15: My company is flexible and takes advantage of opportunities as they arise .	94	5.69	1.15
Q16: My company has avoided courses of action that restrict our flexibility and adaptability	94	5.05	1.53
Q17: My company has a substantial number of agreements with customers, suppliers and other organisations	94	5.1383	1.55
Q18: My company uses pre-commitments from customers and suppliers as often as possible	94	5.15	1.38
Q19: At my company, we talk with people we know to enlist their support in developing the business	94	4.63	1.73

Table 9: EO scale

Construct: EO Scale: 7 point Likert scale

Variable	N	Mean	Std. Dev
Q20: My company typically initiates actions that competitors respond to	94	5.10	1.30
Q21: My company is very often the first business to introduce new products/services, administrative techn .	94	4.79	1.45
Q22: My company typically adopts a very competitive, aggressive stance against competitors	94	4.71	1.45
Q23: My company has a strong inclination for high-risk projects with chances of very high returns	94	3.54	1.57
Q24: Owing to the nature of the environment, bold initiatives are necessary to achieve my company's objec	94	5.03	1.44
Q25: My company typically adopts a bold, aggressive posture in order to maximise the probability of explo	94	4.66	1.41
Q26: My company has a strong emphasis on research and development, technological leadership…	94	4.89	1.82
Q27: My company has many lines of products or services	94	4.73	1.69
Q28: At my company, there have been considerable changes in our product or service lines	94	3.20	1.06

Table 10: Performance scale

Construct: Performance Scale: 7 point Likert scale

Variable	N	Mean	Std. Dev
Q29: Over the past 5 years, our financial performance has exceeded our expectations	90	4.06	1.78
Q30: Over the past 5 years, our financial performance has exceeded that of our competitors	90	4.48	1.40
Q31: Over the past 5 years, we have been more profitable than our competitors have	90	4.48	1.31
Q32: Over the past 5 years, our revenue (sales) growth has exceeded our expectations	90	3.99	1.60
Q33: Over the past 5 years, our revenue growth rate has exceeded that of our competitors	90	4.28	1.31
Q34: Over the past 5 years, our customer satisfaction has been outstanding	90	5.02	1.40
Q35: Over the past 5 years, our customer satisfaction has exceeded that of our competitors	90	4.99	1.16
Q36: Last year, our market was share much higher than that of our competitors	90	4.3	1.46
Q37: Our company is better at introducing new products and services to the market than our competitors	90	4.42	1.40
Q38: Last year, the percentage of our new products in the existing product portfolio exceeded that of our competitors	90	4.1	1.39
Q39: Over the last year, we have introduced innovations for work processes and methods	90	5.33	1.34
Q40: We have innovations under intellectual property protection	90	4.16	1.92

Table 11: Environmental Hostility scale

Construct: Environmental Hostility Scale: 7 point Likert scale

Variable	N	Mean	Std. Dev
Q41: The failure rate of firms in my industry is high	88	4.51	1.60
Q42: My industry is very risky; one bad decision could threaten its viability	88	4.33	1.65
Q43: Competition in my industry is high	88	5.60	1.27
Q44: Customer loyalty in my industry is low	88	4.14	1.70
Q45: Severe price wars are characteristic of my industry	88	4.53	1.73
Q46: Low profit margins are characteristic of my industry	88	4.58	1.83

4.2.2 Descriptive statistics

Multivariate analysis requires that the assumptions underlying the statistical techniques be tested for the separate variables and for the multivariate model (Hair et al., 2010). In this section the research will focus on whether EO meets the normality assumptions. Normality is the most fundamental assumption of multivariate analysis because departures from normality render all resulting statistical tests invalid (Hair et al., 2010).

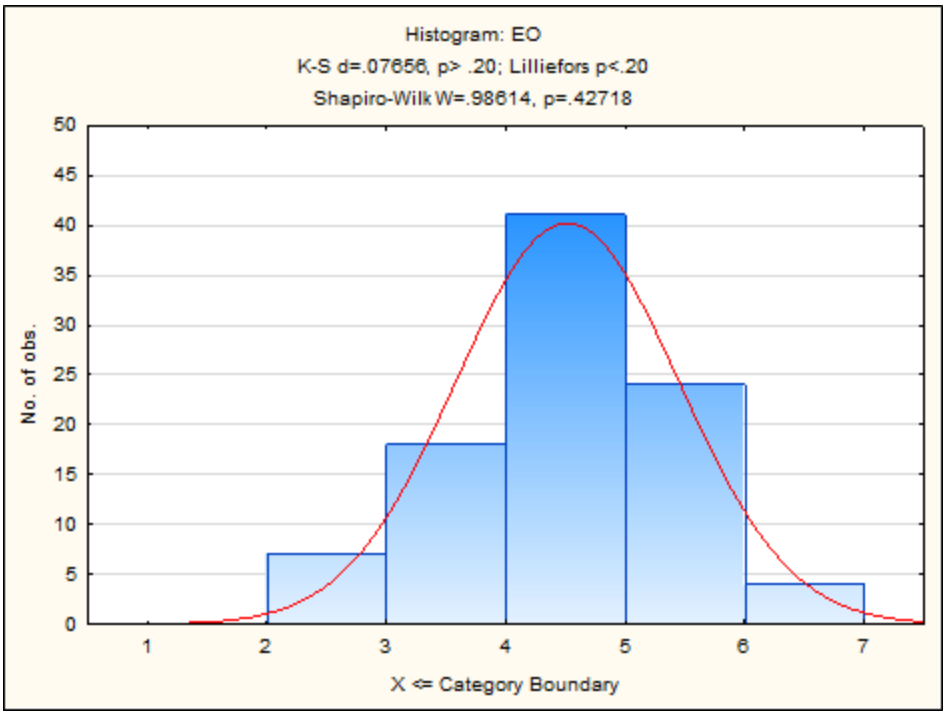


Figure 13: Histogram EO

Figure 13 illustrates a histogram of EO with the normal distribution superimposed over it. The middle of the distribution is higher than the superimposed normal curve whilst both the tails are higher than expected. As indicated in Table 12, kurtosis and skewness are slightly negative. They do not represent a major departure from normality since they are slightly below zero. Further, the Shapiro- Wilks test (p=.43), which calculates the levels of significance for the departure from normality, also indicates that the actual degree of departure from normality is not significant.

	Valid N	Std.Dev.	Skewness	Kurtosis
EO	94.00	0.93	-0.29	-0.07

Table 12: Descriptive stats EO

4.2.2 Psychometric properties EO

Reliability analysis refers to the extent to which a set of variables measures what it is intended to measure (Hair et al., 2010). In contrast to validity, it relates to how a construct is measured not what is measured. Reliability analysis provides an indication of how free a scale is from random error. There are four types of reliability analysis:

- Test-retest
- Inter rater
- Parallel forms
- Internal consistency

The researcher used internal consistency reliability analysis. The idea behind internal consistency reliability analysis is that the variables should be measuring the same construct and thus be highly inter-correlated (Hair et al., 2010). Firstly, Hair et al. (2010) suggest that to diagnose internal consistency we should consider inter-item correlations and item-to-total correlations. Table 13 illustrates the reliability analysis for EO. For the scale, inter-item correlation (0.38) exceeds the recommended 0.30 (Hair et al., 2010). Further, except for Q22 (0.32), item-to-total correlations of all variables are close to or exceed the recommended 0.5 (Hair et al., 2010). Secondly, Hair et al. (2010) suggest researchers should use as a diagnostic measure a reliability coefficient, with Cronbach's alpha being the most commonly used. The recommended lower limit for Cronbach's alpha is 0.7. As illustrated in Table 13, Cronbasch's alpha for the EO scale at 0.84 exceeds this lower limit. Both these diagnostic measures suggest that the EO scale can be considered reliable.

Table 13: Reliability analysis EO

Summary for scale: Mean=40.33 Std.Dv.=8.96 Valid N:95 Cronbach alpha: .84 Standardized alpha: .84 Average inter-item corr.: .38

	Mean if - deleted	Var. if - deleted	StDv. if - deleted	Itm-Totl - Correl.	Alpha if - deleted
Q20	35.27	65.40	8.09	0.56	0.82
Q21	35.58	61.91	7.87	0.65	0.81
Q22	35.65	69.28	8.32	0.32	0.84
Q23	36.81	64.62	8.04	0.48	0.82
Q24	35.34	64.18	8.01	0.55	0.82
Q25	35.71	60.80	7.80	0.73	0.80
Q26	35.47	58.33	7.64	0.63	0.81
Q27	35.63	63.22	7.95	0.48	0.83
Q28	37.15	68.25	8.26	0.56	0.82

4.2.3 Validity

As previously discussed validity is the extent to which the scale measures the concept of interest. The researcher used exploratory factor analysis and the multi trait, multi method (MTMM) matrices to assess validity. Hair et al. (2010) suggest that for samples greater than 85 but smaller than 100 factor loadings greater than 0.6 are significant. Exploratory factor analysis assists us investigate the underlying structure of a set of variables and data reduction (Hair et al. 2010).

As illustrated in Table 14, a statistically significant Bartlett's test of sphericity (sign <0.00) and a satisfactory Kaiser-Meyer-Olkin measure of sampling adequacy (0.71) indicate that sufficient correlations amongst variables exist to proceed with factor analysis.

Table 14: KMO and Bartlett's Test EO

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.71
Bartlett's Test of Sphericity	Approx. Chi-Square	575.44
	df	105.00
	Sig.	.00

Table 15 illustrates factor loadings and the number of factors extracted. Component analysis and orthogonal rotation methods were used. Factors with eigenvalues greater than 1 and factor loadings greater than 0.5, were considered significant. These results do not settle the debate, discussed in the literature review, of whether EO is a uni-dimensional or a multi-dimensional construct since the variables did not load on the same factor. The items for the sub-construct proactiveness seem to load on the second factor whereas the items risk taking (Q25) and for innovativeness (Q26) have significant cross loadings. Irrespective of these inconclusive results, Covin and Slevin's (1989) has been validated in numerous studies (Raunch et al., 2009). Thus, it was decided not to delete any of the items.

Table 15: Exploratory Factor Analysis EO

	Factor	Factor
Q20	0.15	0.82*
Q21	0.24	0.85*
Q22	-0.015	0.63
Q23	0.72*	0.12
Q24	0.77*	0.15
Q25	0.69	0.46
Q26	0.51	0.54
Q27	0.46	0.38
Q28	0.79*	0.12
Expl.Var	2.77	2.51
Prp.Totl	0.31	0.28

Extraction: Principal components (Marked loadings are >.70)

Table 16 : Eigenvalues EO

	Eigenvalue	% Total - variance	Cumulative - Eigenvalue	Cumulative - %
1	4.02	44.71	4.02	44.71
2	1.25	13.93	5.28	58.64

Extraction: Principal components

The MTMM matrices, presented in table 17, were also used to assess convergent validity. Convergent validity assesses the degree to which measures of the same construct are correlated. The inter-item correlations between the sub-constructs of EO are all above 0.3 and significant ($p<0.01$). This indicates that the scale is measuring its intended concept.

Table 17: MTMM EO

	Proactiveness	Risk taking	Innovativeness
Proactiveness	1.00	0.39*	0.42*
Risk taking	0.39*	1.00	0.55*
Innovativeness	0.42*	0.55*	1.00

* Correlation is significant at the 0.01 level (2-tailed)
** Correlation is significant at the 0.05 level (2-tailed)

4.3 Effectuation

4.3.1 Descriptive statistics

Figure 14 illustrates a histogram of effectuation with the normal distribution superimposed over it. The middle of the distribution is higher than the superimposed normal curve whilst both the tails are higher than expected. As indicated in Table 18, kurtosis is slightly positive and skewness is negative. However, they do not represent a major departure from normality since they are vary slightly from zero. Further, the Shapiro- Wilks test (p=.51), which calculates the levels of significance for the departure from normality, also indicates that the actual degree of departure from normality is not significant.

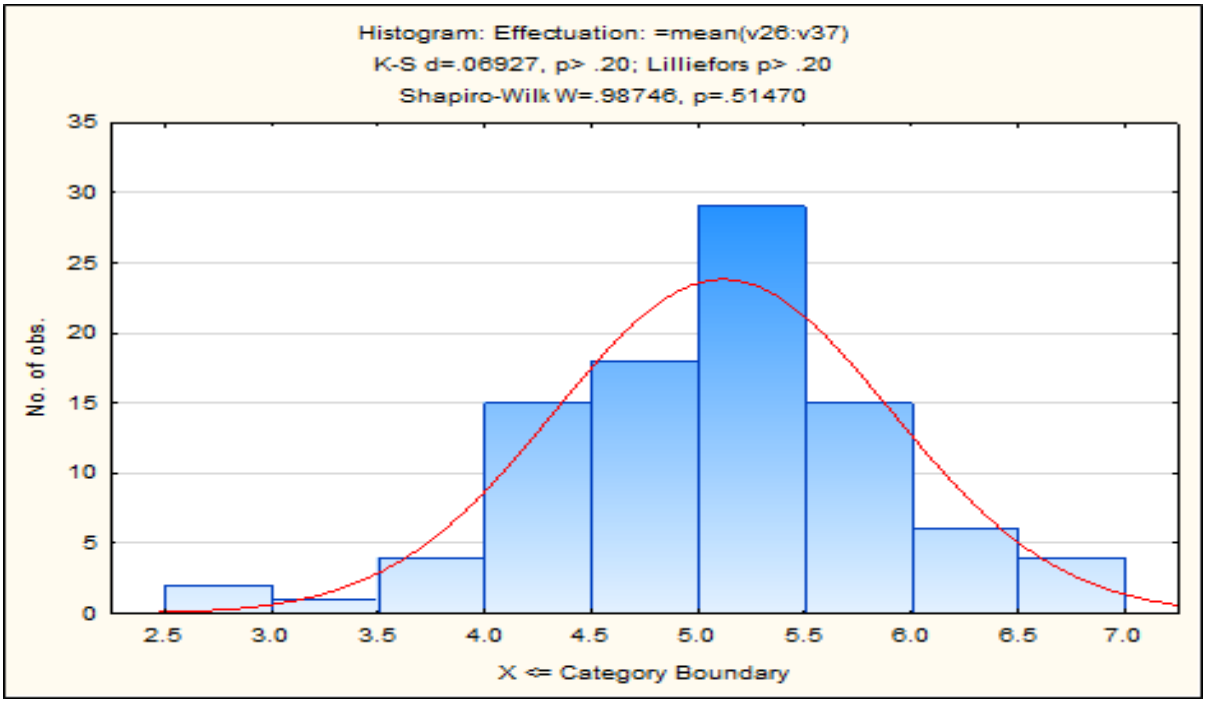


Figure 14: Histogram Effectuation

Table 18: Effectuation descriptive statistics

	Valid N	Std.Dev.	Skewness	Kurtosis
Effectuation	94.00	0.79	-0.21	0.56

4.3.2 Psychometric properties Effectuation

Initially a MTMM analysis was conducted to test the convergent validity of the effectuation construct. Chandler et al. (2011) suggest that effectuation is a formative, multidimensional construct based on their findings of low correlations amongst the effectuation sub-constructs. They argued that the sub-constructs of formative constructs

need not be correlated since they are the defining characteristic of the construct and may be independent of each other.

Table 19: MTMM Effectuation

	Experimentation	Affordable loss	Flexibility	Pre-commitments
Experimentation	1.00	0.05	0.42*	0.21**
Affordable loss)	0.05	1.00	0.20	0.27*
Flexibility	0.42*	0.20	1.00	0.27*
Pre-commitments	0.21**	0.27*	0.27*	1.00

* Correlation is significant at the 0.01 level (2-tailed)
** Correlation is significant at the 0.05 level (2-tailed)

Table 19 indicates the correlations between the sub-constructs of effectuation. Similar to Chandler et al. (2011), low inter-item correlations were found between some of the effectuation sub-constructs. The researcher proceeded to treat effectuation as a formative construct consisting of reflective first order sub-constructs. The reflective first order sub-constructs are assessed with commonly used statistics such as Cronbach's alpha and exploratory factor analysis even though the second order effectuation sub-construct is a formative construct (Chandler et al., 2011).

Table 20: Reliability analysis: Effectuation sub scales

Experimentation: Mean=17.63 Std.Dv.=4.63 Valid N:94 Cronbach alpha: .64 Standardized alpha: .66 Average inter-item corr.: .350

	Mean if - deleted	Var. if - deleted	StDv. if - deleted	Itm-Totl - Correl.	Alpha if - deleted
Q6	14.56	14.59	3.82	0.23	0.72
Q7	12.03	14.39	3.79	0.53	0.52
Q8	12.54	13.55	3.68	0.46	0.55
Q9	13.78	11.00	3.32	0.55	0.47

Affordable loss: Mean=14.5638 Std.Dv.=3.83 Valid N:94 Cronbach alpha: .72 Standardized alpha: .74 Average inter-item corr.: .50

Q7-9	Mean if - deleted	Var. if - deleted	StDv. if - deleted	Itm-Totl - Correl.	Alpha if - deleted
Q7	9.47	6.97	2.64	0.63	0.52
Q8	10.70	6.85	2.62	0.44	0.80
Q9	8.96	8.36	2.89	0.61	0.58

Affordable loss: Mean=14.93 Std.Dv.=3.84 Valid N:94 Cronbach alpha: .76 Standardized alpha: .75 Average inter-item corr.: .52

Q10-12	Mean if - deleted	Var. if - deleted	StDv. if - deleted	Itm-Totl - Correl.	Alpha if - deleted
Q10	10.59	6.01	2.45	0.66	0.59
Q11	10.06	6.32	2.51	0.72	0.52
Q12	9.22	9.49	3.08	0.42	0.83

Flexibility: Mean=21.62 Std.Dv.=4.16 Valid N:94 Cronbach alpha: .71 Standardized alpha: .74 Average inter-item corr.: .43

Q13-16	Mean if - deleted	Var. if - deleted	StDv. if - deleted	Itm-Totl - Correl.	Alpha if - deleted
Q13	15.83	10.82	3.29	0.61	0.60
Q14	16.54	10.21	3.19	0.38	0.75
Q15	15.94	11.10	3.33	0.61	0.60
Q16	16.57	10.07	3.17	0.49	0.66

Pre-commitments: Mean=14.92 Std.Dv.=2.61 Valid N:94 Cronbach alpha: -.10 Standardized alpha: --- Average inter-item corr.: -.003

Q17-19	Mean if - deleted	Var. if - deleted	StDv. if - deleted	Itm-Totl - Correl.	Alpha if - deleted
Q17	9.79	3.72	1.93	0.11	0.00
Q18	9.78	4.17	2.04	0.12	0.00
Q19	10.29	6.08	2.47	-0.27	0.60

Pre-commitments: Mean=10.29 Std.Dv.=2.48 Valid N:94 Cronbach alpha: .60 Standardized alpha: .60 Average inter-item corr.: .43

Q17-18	Mean if - deleted	Var. if - deleted	StDv. if - deleted	Itm-Totl - Correl.	Alpha if - deleted
Q17	5.149	1.893	1.376	0.427	
Q18	5.138	2.374	1.541	0.427	

Table 20 illustrates the reliability analysis for the effectuation sub-scales: experimentation, affordable loss, flexibility and partnerships. For the experimentation scale the inter-item correlation (0.35) exceeds the recommended 0.30 (Hair et al., 2010). However, the total to item correlation of Q6 is 0.23. Cronbach's alpha of 0.64 is also below 0.7. We deleted Q6 resulting in improved item-to-total correlations for Q7, Q8 and Q9 and a satisfactory Cronbach's alpha (0.72). Similarly Q19 had a negative item to total correlations of -0.27 and the pre-commitments subscale a Cronbach's alpha of -0.1. Q19 was deleted and the Cronbach's alpha improved to 0.6, similar to what Chandler et al. (2011) found in their validation study. The flexibility and affordable loss sub scales yielded satisfactory results on both these diagnostic measures.

4.3.3 Validity Effectuation

The researcher proceeded to test the first order effectuation sub-constructs for validity. As illustrated in Table 21 statistically significant Bartlett's test of sphericity (sign <0.00) and a satisfactory Kaiser-Meyer-Olkin measure of sampling adequacy (0.647) indicate we could proceed with factor analysis.

Table 21: KMO and Bartlett's Test Effectuation

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.647
Bartlett's Test of Sphericity	Approx. Chi-Square	384.731
	df	66
	Sig.	0.00

Table 22 illustrates factor loadings and the number of factors extracted. Component analysis and orthogonal rotation methods were used. Factors with eigenvalues greater than 1 and factor loadings greater than 0.5, were considered significant. These results confirm the findings of Chandler et al. (2011) that effectuation is a multi-dimensional construct with four sub-constructs: experimentation, affordable loss, flexibility and pre-commitments. The factors loaded cleanly on the four effectuation sub-constructs and there were no significant cross loadings. As table 23 illustrates, the four factors explain 69% of the variance.

Table 22: Factor Loadings Effectuation

	Factor	Factor	Factor	Factor
Q7:	0.14	-0.09	0.89*	0.01
Q8	0.13	0.05	0.88*	0.06
Q9	0.32	0.04	0.51	0.27
Q10	0.17	0.85*	-0.06	0.13
Q11	-0.09	0.90*	-0.06	0.09
Q12	0.05	0.66*	0.22	0.00
Q13	0.76*	-0.02	0.09	0.38
Q14	0.49	0.31	0.09	0.18
Q15	0.78*	0.02	0.37	0.06
Q16	0.81*	0.05	0.08	-0.14
Q17	0.17	0.22	0.04	0.74*
Q18	0.00	0.07	0.06	0.86*
Expl.Var	2.28	2.13	2.05	1.59
Prp.Totl	0.19	0.18	0.17	0.13

Extraction: Principal components (Marked loadings are >.70)

Table 23: Eigenvalues Effectuation

	Eigenvalue	% Total - variance	Cumulative Eigenvalue	Cumulative - %
1	4.08	33.98	4.08	33.98
2	1.99	16.61	6.07	50.59
3	1.15	9.57	7.22	60.16
4	1.10	9.18	8.32	69.34

Extraction: Principal components

4.4 Measurement aspects of Performance

4.4.1 Descriptive statistics

Figure 15 illustrates a histogram of performance with the normal distribution superimposed over it. The middle of the distribution is higher than the superimposed normal curve whilst both the tails are higher than expected. As indicated in Table 24, kurtosis is slightly positive and skewness is negative. However, they do not represent a major departure from normality since they vary slightly from zero. Further, the Shapiro-Wilks test (p=.12), which calculates the levels of significance for the departure from normality, also indicates that the actual degree of departure from normality is not significant.

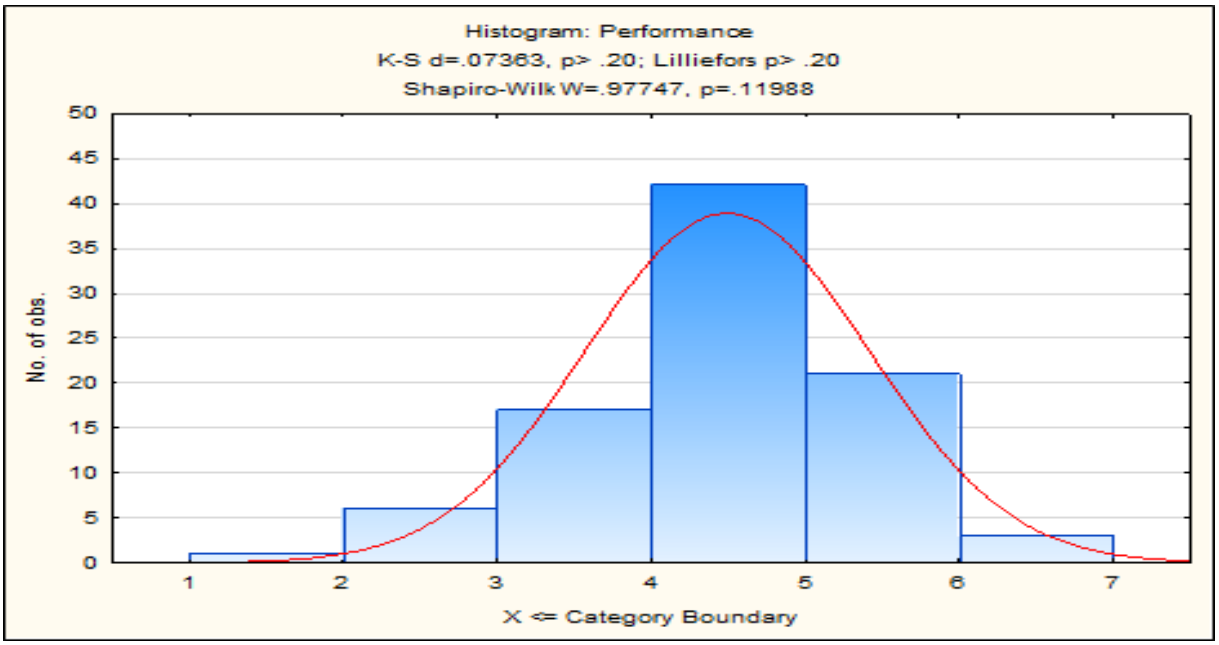


Figure 15: Performance normality test

Table 24: Performance descriptive statistics

	Valid N	Std.Dev.	Skewness	Kurtosis
Performance	90.00	0.92	-0.55	0.69

4.4.2 Psychometric properties Performance

Table 25 illustrates the reliability analysis for performance. For the scale, the inter-item correlation (0.37) exceeds the recommended 0.30 (Hair et al., 2010). Further, except for Q40 (0.14), item-to-total correlations of all variables are close to or exceed the recommended 0.5 (Hair et al., 2010). We deleted item Q40. Secondly, Hair et al. (2010) suggest researchers should use as a diagnostic measure a reliability coefficient, with Cronbach's alpha being the most commonly used. The recommended lower limit for

Cronbach's alpha is 0.7. Cronbach's alpha for the performance scale at 0.86 exceeds this lower limit. Both these diagnostic measures suggest that the EO scale can be considered reliable.

Table 25: Reliability Performance

Summary for scale: Mean=53.14 Std.Dv.=11.3035 Valid N:90 Cronbach alpha: .86 Standardized alpha: .87 Average inter-item corr.: .37

	Mean if - deleted	Var. if - deleted	StDv. if - deleted	Itm-Totl - Correl.	Alpha if - deleted
Q29: Over the past 5 years, our financial performance has exceeded our expectations	49.12	98.08	9.90	0.71	0.83
Q30: Over the past 5 years, our financial performance has exceeded that of our competitors	48.70	104.08	10.20	0.69	0.84
Q31: Over the past 5 years, we have been more profitable than our competitors have	48.70	106.08	10.30	0.67	0.84
Q32: Over the past 5 years, our revenue (sales) growth has exceeded our expectations	49.19	100.04	10.00	0.74	0.83
Q33: Over the past 5 years, our revenue growth rate has exceeded that of our competitors	48.90	105.45	10.27	0.70	0.84
Q34: Over the past 5 years, our customer satisfaction has been outstanding	48.16	109.94	10.49	0.47	0.85
Q35: Over the past 5 years, our customer satisfaction has exceeded that of our competitors	48.20	112.91	10.63	0.46	0.85
Q36: Last year, our market was share much higher than that of our competitors	48.88	109.10	10.44	0.48	0.85
Q37: Our company is better at introducing new products and services to the market than our competitors	48.76	106.18	10.30	0.62	0.84
Q38: Last year, the percentage of our new products in the existing product portfolio exceeded that of our competitors	49.08	108.27	10.41	0.55	0.85
Q39: Over the last year, we have introduced innovations for work processes and methods	47.86	113.60	10.66	0.36	0.86
Q40: We have innovations under intellectual property protection	49.02	116.83	10.81	0.14	0.88

4.4.3 Validity Performance

As illustrated in Table 26 a statistically significant Bartlett's test of sphericity (sig <0.00) and a satisfactory Kaiser-Meyer-Olkin measure of sampling adequacy (0.769) indicate

that sufficient correlations amongst variable exist and the researcher could proceed with factor analysis.

Table 26: KMO and Bartlett's Test Performance

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.769
Bartlett's Test of Sphericity	Approx. Chi-Square	542.024
	df	66
	Sig.	.000

Exploratory factor analysis is used to test the validity of the performance scale. Table 27 illustrates factor loadings and the number of factors extracted. Component analysis and orthogonal rotation methods were used. Factors with eigenvalues greater than 1 and factor loadings greater than 0.5, were considered significant. These results seem to confirm Venkataraman and Ramanujam's (1986) view that performance is a multi-dimensional construct since the variables did not load on the same factor.

Q29-Q33 loaded on the same factor. This was characterized as financial performance. The items Q34-Q36 were characterized as market performance (Vankataraman and Ramanujam, 1986). Q36 did not load as expected, however market share has been generally deemed to be a component of market performance (Vankataraman and Ramanujam, 1986) and thus it was included as a component of the market performance sub-construct. The items Q37-39 all significantly loaded on the same factor and they were characterized as innovative performance. Table 28 indicates that there were three factors with eigenvalues greater than 1 and they explained cumulatively 70% of the variance.

Table 27: Factor Loadings Performance

	Factor	Factor	Factor
Q29	0.80*	0.29	0.08
Q30	0.86*	0.12	0.20
Q31	0.89*	0.09	0.14
Q32	0.73*	0.32	0.26
Q33	0.76*	0.19	0.32
Q34	0.17	0.16	0.90*
Q35	0.23	0.07	0.88*
Q36	0.26	0.54	0.27
Q37	0.21	0.83*	0.25
Q38	0.30	0.78*	-0.02
Q39	0.04	0.60*	0.15
Expl.Var	3.55	2.22	1.99
Prp.Totl	0.32	0.20	0.18

Extraction: Principal components (Marked loadings are >.700000)

Table 28: Eigenvalues Performance

	Eigenvalue	% Total - variance	Cumulative - Eigenvalue	Cumulative - %
1.00	5.18	47.07	5.18	47.07
2.00	1.33	12.10	6.51	59.17
3.00	1.25	11.36	7.76	70.53

Extraction: Principal components

The MTMM matrices, illustrated in table 29, were also used to assess the convergent validity of performance. Convergent validity assesses the degree to which measures of the same construct are correlated. The inter-item correlations between the sub-constructs of performance are all above 0.3 and significant ($p<0.01$). This indicates that the scale is measuring its intended concept.

Table 29: MTMM Performance

	Performance: Financial	Performance: Market	Performance: Innovativeness
Performance: Financial	1.00	0.47*	0.44*
Performance: Market	0.47*	1.00	0.38*
Performance: Innovativeness	0.43*	0.38*	1.00

* Correlation is significant at the 0.01 level (2-tailed)
** Correlation is significant at the 0.05 level (2-tailed)

4.5 Measurement aspects of Hostility

4.5.1 Descriptive Statistics

Figure 16 illustrates a histogram of environmental hostility with the normal distribution superimposed over it. The middle of the distribution is slightly higher than the superimposed normal curve whilst both the tails are higher than expected. The ditribution is skewed to the right. As indicated in Table 30, kurtosis and skewness are slightly negative. They do not represent a major departure from normality though since they are slightly below zero. Further, the Shapiro- Wilks test (p=.06), which calculates the levels of significance for the departure from normality, also indicates that the actual degree of departure from normality is not significant.

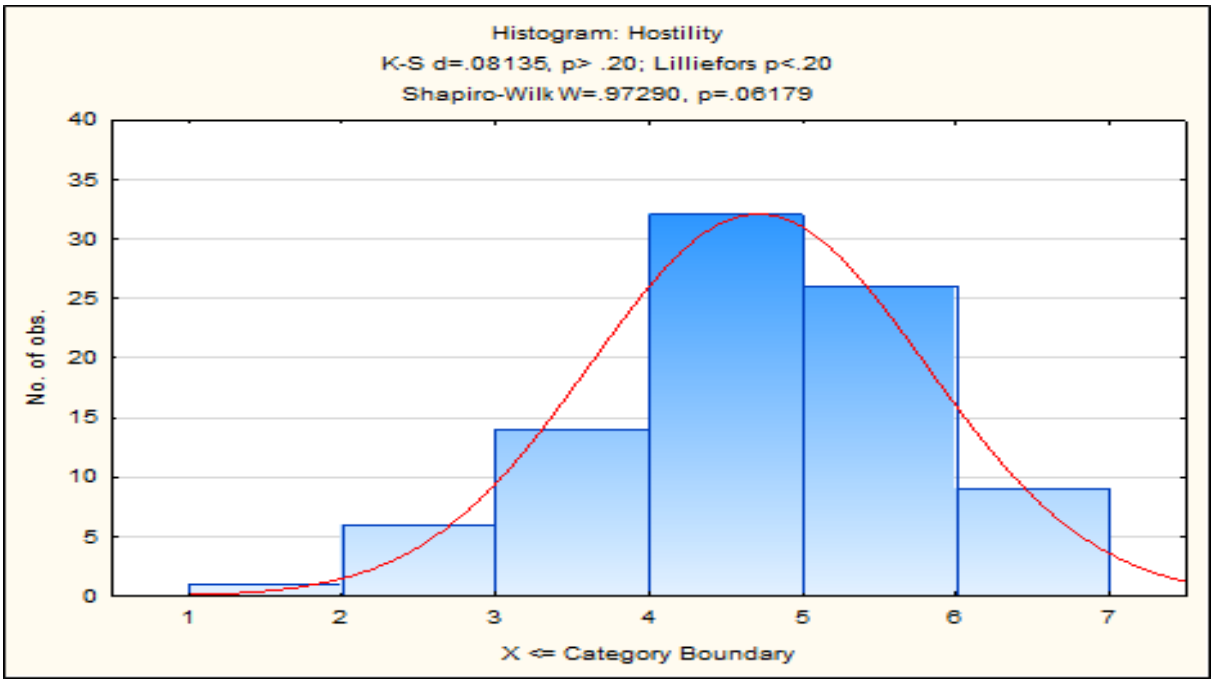


Figure 16: Hostility normality test

Table 30: Hostility descriptive statistics

	Valid N	Std.Dev.	Skewness	Kurtosis
Hostility	88.00	1.09	-0.49	-0.03

4.5.2 Psychometric properties Environmental hostility

Table 31 illustrates the reliability analysis for environmental hostility. The inter-item correlation (0.29) is below the recommended 0.30 (Hair et al., 2010). Further the item-to-total correlations of Q44 (0.2) is below the recommended 0.5 (Hair et al., 2010). We deleted item Q44. The resulting item-to-total correlations were satisfactory and the average inter-item correlation improved to 0.37. Secondly, Hair et al. (2010) suggests researchers should use as a diagnostic measure a reliability coefficient, with Cronbach's alpha being the most commonly used. The recommended lower limit for Cronbach's

alpha is 0.7. Cronbach's alpha for the environmental hostility scale at 0.73 exceeds this lower limit. Both these diagnostic measures suggest that the environmental hostility scale can be considered reliable.

Table 31: Reliabilty Analysis Hostility

Summary for scale: Mean=27.45 Std.Dv.=6.35 Valid N:89 Cronbach alpha: .70 Standardized alpha: .70 Average inter-item corr.: .29

	Mean if - deleted	Var. if - deleted	StDv. if - deleted	Item-Tot l - Correl.	Alpha if - deleted
Q41	22.98	29.19	5.40	0.45	0.65
Q42	23.16	29.64	5.44	0.41	0.66
Q43	21.90	30.72	5.54	0.49	0.65
Q44	23.35	33.04	5.75	0.20	0.73
Q45	22.96	27.10	5.21	0.53	0.62
Q46	22.91	26.35	5.13	0.53	0.62

Summary for scale: Mean=23.35 Std.Dv.=5.78 Valid N:89 Cronbach alpha: .73 Standardized alpha: .74 Average inter-item corr.: .37

	Mean if - deleted	Var. if - deleted	StDv. if - deleted	Itm-Totl - Correl.	Alpha if - deleted
Q41	18.88	22.29	4.72	0.53	0.67
Q42	19.06	23.22	4.82	0.44	0.70
Q43	17.80	24.18	4.92	0.53	0.68
Q45	18.85	21.16	4.60	0.55	0.66
Q46	18.81	21.97	4.69	0.44	0.71

4.5.3 Validity Hostility

Once again exploratory factor analysis is used to test validity. Table 33 illustrates factor loadings and the number of factors extracted. Component analysis and orthogonal rotation methods were used. Factors with eigenvalues greater than 1 and factor loadings greater than 0.5, were considered significant. Our results seem to suggest that hostility is a multi-dimensional construct with two sub-constructs. They were characterized as riskiness and competition. As illustrated in Table 32 a statistically

significant Bartlett's test of sphericity (sign <0.00) and a satisfactory Kaiser-Meyer-Olkin measure of sampling adequacy (0.642) indicate that sufficient correlations amongst variable exist and the researcher could proceed with factor analysis.

Table 32: KMO and Bartlett's Test Hostility

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.642
Bartlett's Test of Sphericity	Approx. Chi-Square	93.920
	df	10
	Sig.	.000

Table 33: Factor Loadings Hostility

Factor Loadings (Varimax raw) Extraction: Principal components (Marked loadings are >.700000)

	Factor	Factor
Q41	0.24	0.84*
Q42	0.08	0.90*
Q43	0.81*	0.17
Q44	0.85*	0.15
Q45	0.67	0.19
Expl.Var	1.90	1.61
Prp.Totl	0.38	0.32

Extraction: Principal components (Marked loadings are >.70)

As Table 33 indicates, there were two factors with eigenvalues greater than 1 and they explained cumulatively 70.22% of the variance.

Table 34: Eigenvalues Environmental hostility

	Eigenvalue	% Total - variance	Cumulative - Eigenvalue	Cumulative - %
1	2.45	48.91	2.45	48.91
2	1.07	21.31	3.51	70.22

Extraction: Principal components

MTMM matrices were also used to assess the convergent validity of hostility. Convergent validity assesses the degree to which to measures of the same construct are correlated. The inter-item correlations between the sub-constructs of environmental hostility are all above 0.3 and significant ($p<0.01$). This indicates that the scale is measuring its intended concept.

Table 35: MTMM Environmental Hostility

	Hostility: Riskiness	Hostility: Competition
Hostility: Riskiness	1.000000	0.332524*
Hostility: Competition	0.332524*	1.000000

* Correlation is significant at the 0.01 level (2-tailed)
** Correlation is significant at the 0.05 level (2-tailed)

4.6 Discriminant validity: EO and effectuation

Exploratory factor analysis provides an empirical basis for judging the structure of the variables (Hair et al., 2010). Factor analysis provides the tools for analyzing the structure of the correlations of a large number of variables by extracting factors. If researchers have a conceptual basis for understanding the relationships between variables, then the dimensions may have meaning for what they collectively represent (Hair, 2010).

Discriminant validity is the degree to which two conceptually similar concepts are distinct (Hair et al., 2010). The researcher conducted exploratory factor analysis in order to help determine whether the sub-constructs of effectuation load differently from EO. As illustrated in Table 36 statistically significant Bartlett's test of sphericity (sig <0.00) and a satisfactory Kaiser-Meyer-Olkin measure of sampling adequacy (0.708) indicate we could proceed with factor analysis.

Table 36: KMO and Bartlett's Test EO and Effectuation

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.708
Bartlett's Test of Sphericity	Approx. Chi-Square	881.586
	df	210
	Sig.	.000

Component analysis and orthogonal rotation methods were used. Table 37 illustrates factor loadings and the number of factors extracted. Factors with eigenvalues greater than 1 and factor loadings greater than 0.5, were considered significant. The results seem to indicate that effectuation sub-constructs are distinct from EO. As expected and confirmed by the Scree test in figure 17, seven factors were extracted representing: experimentation, affordable loss, flexibility, pre-commitments, proactiveness, risk taking and innovativeness. The factors all had eigenvalues above 1 and collectively explained more than 71% of the variance. The variables Q7 and Q8, of the experimentation sub-construct, loaded together whereas Q9 did not. Q9 ("The product/service that my company now provides is substantially different than we first imagined") loaded with the

risk taking (Q23-Q25) sub-construct of EO. Similarly Q29 (“At my company, there have been considerable changes in our product or service lines”), a variable of the sub-construct innovativeness, loaded on the risk taking sub-construct of EO. Both Q9 and Q29 seem to indicate launching new initiatives and thus assuming risk. As a result the cross loadings were not deemed to be a major concern.

Overall the results indicate that the constructs are distinct since items that are theorized to load on the same construct actually did, providing evidence of convergence validity (Chandler et al. 2011). Further, the EO and effectuation items loaded on different constructs, providing evidence of discriminant validity (Chandler et al. 2011).

Table 37: Factor loadings EO and Effectuation

	Factor	Factor	Factor	Factor	Factor	Factor	Factor
Q7	0.11	-0.11	-0.01	0.13	-0.01	0.83*	0.36
Q8	0.34	0.04	0.12	0.13	0.06	0.82*	0.03
Q9	0.53	0.15	-0.30	0.33	0.06	0.28	0.25
Q10	0.07	0.87*	0.00	0.16	0.09	-0.08	0.05
Q11	0.00	0.92*	-0.01	-0.08	0.06	-0.03	-0.06
Q12	-0.34	0.53	0.29	0.09	0.15	0.37	0.02
Q13	0.00	-0.01	0.05	0.74*	0.33	0.02	0.38
Q14	-0.15	0.29	-0.14	0.56	0.14	0.25	-0.09
Q15	0.21	0.00	0.19	0.77*	0.06	0.27	0.09
Q16	0.23	0.08	0.02	0.75*	-0.12	0.02	-0.04
Q17	0.15	0.26	0.04	0.15	0.72*	-0.04	0.03
Q18	-0.03	0.06	-0.09	0.05	0.85*	0.07	0.09
Q20	0.02	-0.07	0.68	0.31	-0.04	0.17	0.27
Q21	0.03	-0.09	0.51	0.30	-0.17	0.18	0.61
Q22	0.15	0.17	0.75*	-0.10	-0.03	-0.04	0.01
Q23	0.73*	0.04	0.17	0.13	0.08	0.10	0.12
Q24	0.65	-0.16	0.29	0.10	0.23	0.34	-0.08
Q25	0.41	-0.13	0.36	0.40	0.33	0.27	0.30
Q26	0.20	-0.18	0.21	0.18	0.06	0.23	0.67
Q27	0.16	0.14	0.00	-0.01	0.21	0.15	0.79*
Q28	0.69	0.08	-0.07	0.12	-0.16	0.28	0.38
Expl.Var	2.36	2.21	1.84	2.64	1.70	2.12	2.14
Prp.Totl	0.11	0.11	0.09	0.13	0.08	0.10	0.10

Extraction: Principal components (Marked loadings are >.70)

Table 38: Eigenvalues EO and Effectuation

Eigenvalues (Data all2 corrected) Extraction: Principal components

	Eigenvalue	% Total - variance	Cumulative - Eigenvalue	Cumulative - %
1.00	5.78	27.53	5.78	27.53
2.00	2.53	12.04	8.31	39.57
3.00	1.66	7.89	9.97	47.47
4.00	1.50	7.14	11.47	54.61
5.00	1.33	6.34	12.80	60.95
6.00	1.18	5.63	13.98	66.58
7.00	1.04	4.95	15.02	71.53

Extraction: Principal components

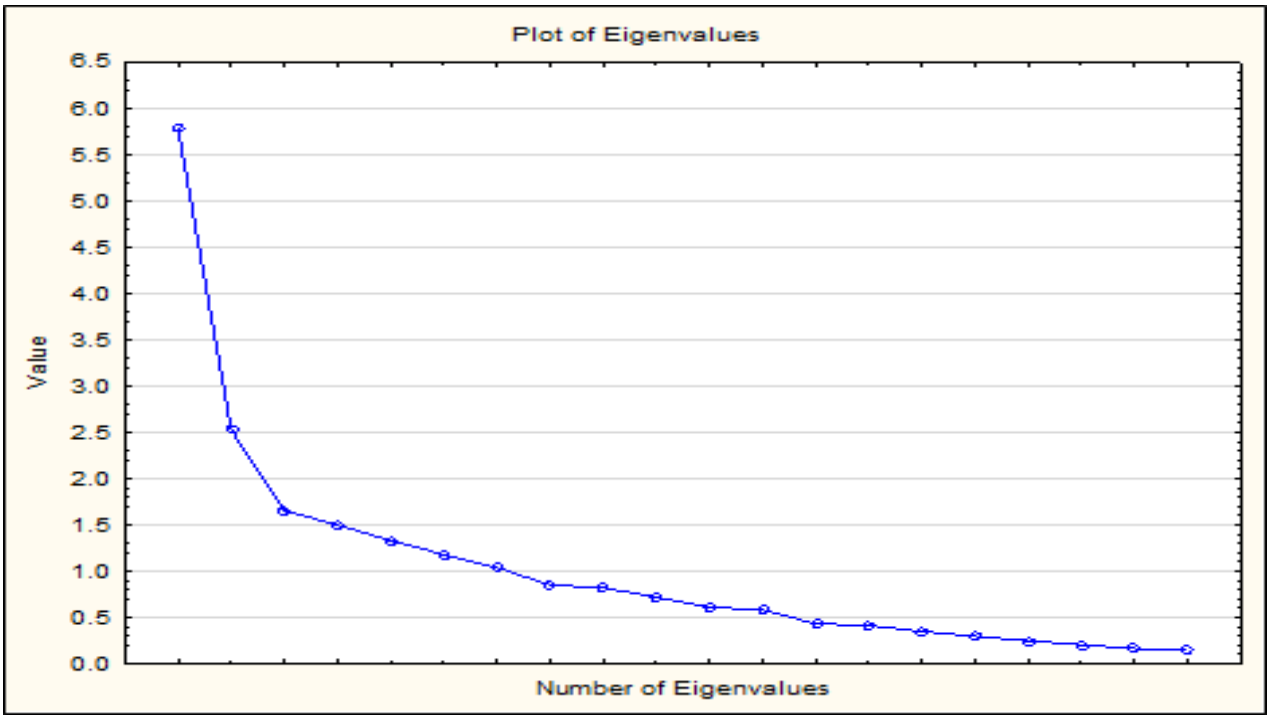


Figure 17: Scree Test EO and Effectuation

4.6.1 Discriminant validity MTMM EO and Effectuation

Table 39: MTMM EO and Effectuation

	experimentation	affordable loss	flexibility	Pre-commitments
Proactiveness	0.26*	0.05	0.27*	0.00
Risk taking	0.54*	-0.01	0.38*	0.25*
Innovativeness	0.55*	0.01	0.31*	0.16

* Correlation is significant at the 0.01 level (2-tailed)
** Correlation is significant at the 0.05 level (2-tailed)

The MTMM matrices were also used to assess the discriminant validity between EO and effectuation. As indicated in table 39 the inter-item correlations between the sub-constructs flexibility and experimentation and risk taking and innovativeness are all above 0.3 and significant ($p<0.01$). This tends to contradict the notion that effectuation and EO are distinct. However, Chandler (2011) argues that the four sub-constructs of

effectuation are best represented as four independent factors that provide unique and important facet of effectuation. Secondly, factor analysis does not indicate double loading between experimentation, flexibility and EO. Thirdly, the sub-constructs affordable loss and pre-commitment show very low or negative correlations with the sub-constructs of EO. Fourthly, there is theoretical and empirical support for the strong and significant correlation between experimentation and flexibility and EO, as EO is associated with experimenting, freely associating and entering into new product markets (Wiklund and Shepherd, 2011). Lastly, effectuation has been associated with uncertainty by Sarasvathy (2001a, 2001b). Using environmental hostility as a proxy we find that environmental hostility is positively correlated with effectuation (p=0.030) and flexibility (p=0.044) whereas there is no significant relation with EO or its sub-constructs. This provides further evidence of predictive and discriminant validity.

4.7 Discriminant validity: Environmental hostility and effectuation

Exploratory factor analysis was conducted in order to help determine whether the sub-constructs of effectuation differ from environmental hostility. As illustrated in Table 40 statistically significant Bartlett's test of sphericity (sig <0.00) and a satisfactory Kaiser-Meyer-Olkin measure of sampling adequacy (0.640) indicate the researcher could proceed with factor analysis.

Table 40: KMO and Bartlett's Test Hostility and Effectuation

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.640
Bartlett's Test of Sphericity	Approx. Chi-Square	524.307
	df	153
	Sig.	.000

Component analysis and orthogonal rotation methods were used. Table 41 illustrates factor loadings and the number of factors extracted. Factors with eigenvalues greater than 1 and factor loadings greater than 0.5, were considered significant. Our results seem to indicate that the effectuation sub-constructs are distinct from environmental hostility. As expected and confirmed by the Scree test in figure 18, five factors were extracted representing: experimentation, affordable loss, flexibility, pre-commitments, riskiness and competition. The factors all had eigenvalues above 1 and collectively explained more than 69% of the variance. The items loaded cleanly on the constructs they were theorized to load on.

Overall the results indicate that the constructs are distinct since items that are theorized to load on the same construct actually did, providing evidence of convergence validity (Chandler et al. 2011). Further, environmental hostility and effectuation items loaded on different constructs, providing evidence of discriminant validity (Chandler et al. 2011).

Table 41: Factor loadings Effectuation and Environmental Hostility

	Factor	Factor	Factor	Factor	Factor	Factor
Q7	0.89*	-0.05	0.02	-0.03	0.18	-0.02
Q8	0.91*	0.02	0.05	0.08	0.13	0.11
Q9	0.46	0.09	-0.08	0.37	0.32	0.33
Q10	-0.06	0.84*	-0.04	0.16	0.17	0.16
Q11	-0.04	0.89*	-0.01	0.13	-0.12	0.09
Q12	0.27	0.62*	0.30	-0.37	0.09	-0.04
Q13	0.08	-0.01	0.18	-0.02	0.76*	0.36
Q14	0.07	0.30	0.16	0.19	0.44	0.23
Q15	0.37	0.04	0.07	-0.01	0.78*	0.04
Q16	0.13	0.01	-0.07	0.09	0.81*	-0.13
Q17	0.08	0.15	0.05	0.06	0.15	0.76*
Q18	0.06	0.12	0.00	-0.13	0.00	0.83*
Q41	0.10	0.07	0.27	0.79*	-0.01	-0.07
Q42	0.01	0.19	0.13	0.78*	0.08	-0.04
Q43	0.16	-0.06	0.74*	0.18	0.15	-0.03
Q45	0.00	-0.03	0.84*	0.14	0.09	0.11
Q46	-0.08	0.22	0.68*	0.10	-0.10	-0.07
Expl.Var	2.12	2.11	1.97	1.70	2.30	1.66
Prp.Totl	0.12	0.12	0.12	0.10	0.14	0.10

Extraction: Principal components (Marked loadings are >.70)

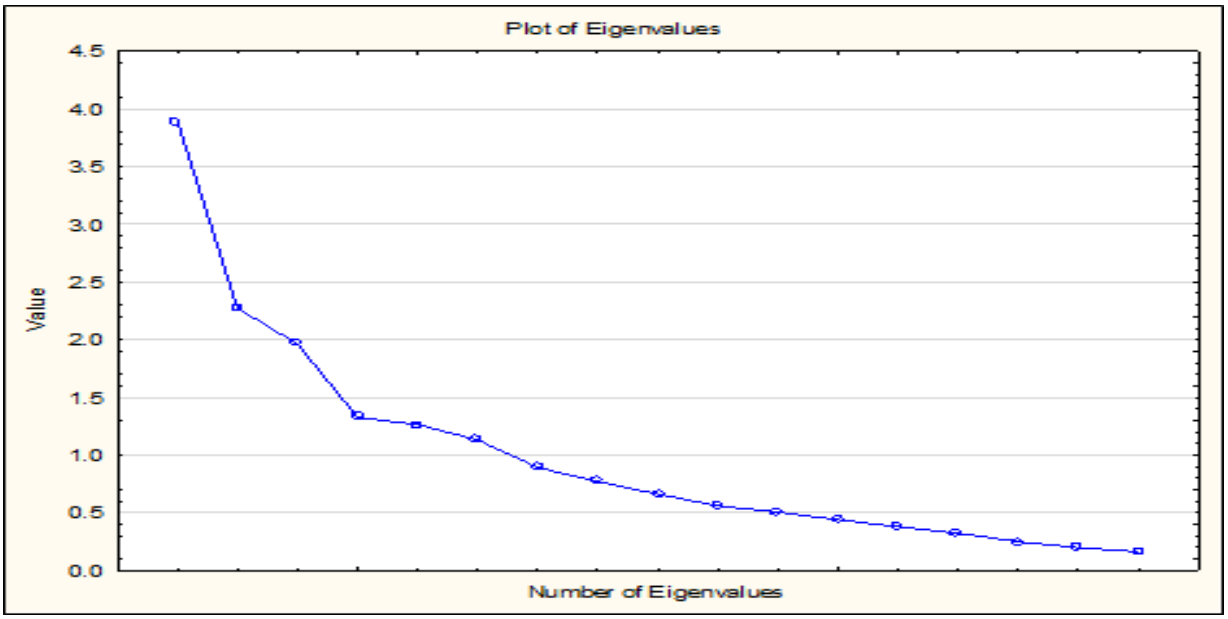


Figure 18: Scree Test Effectuation and Hostility

Table 42: Eigenvalues Effectuation and Hostility

Eigenvalues (Data all2 corrected) Extraction: Principal components

	Eigenvalue	% Total - variance	Cumulative - Eigenvalue	Cumulative - %
1	3.89	22.90	3.89	22.90
2	2.27	13.38	6.17	36.28
3	1.96	11.55	8.13	47.83
4	1.33	7.80	9.46	55.63
5	1.27	7.44	10.72	63.08
6	1.13	6.65	11.85	69.73

Extraction: Principal components

4.7.1 Discriminant validity Effectuation and Hostility

Table 43: MTMM Effectuation and Hostility

	experimentation	affordable loss	flexibility	Pre-commitments
Riskiness	0.17	0.16	0.18	0.00
Competition	0.09	0.14	0.17	0.04

The MTMM matrices were also used to assess the discriminant validity between EO and effectuation. As indicated in Table 43 the inter-item correlations between the sub-constructs are all below 0.3 and not significant ($p>0.1$). This provides evidence of that effectuation and environmental hostility are distinct.

4.8 T-tests: high technology vs medium technology

The researcher used the t-test to assess whether there were significant differences between high technology and medium technology firms. Low technology firms (N=7) were disregarded due to the small sample size. The Z and the t-test are used to test for the differences between two means (Cooper and Schindler, 2011). The t-test is used when the sample size is small (Cooper and Schindler, 2011). As the results in table 44

indicate there were no significant differences amongst the dependent variables-performance and effectuation. However, there was a slight difference on EO (p=0.05) and innovatiness (p=0.01) though. Contrary to our expectations, this difference did not translate into performance outcomes, even innovative performance. The researcher concluded that there were no material differences and grouped all the respondents when performing regression analysis.

Table 44: T-tests; Grouping: Level of technological advancement of your firm (Group 1: high tech Group 2: medium tech)

	Mean - high tech	Mean - medium tech	t-value	df	p	Valid N - high tech	Valid N - medium tech	Std.Dev. - high tech	Std.Dev. - medium tech	F-ratio - Variances	p - Variances	d	Result
Effectuation	5.20	5.06	0.81	86.00	0.42	34.00	54.00	0.83	0.75	1.24	0.47	0.18	No difference
EO	4.78	4.39	1.97	86.00	0.05**	34.00	54.00	0.84	0.93	1.24	0.51	0.44	Slight difference
Performance	4.59	4.48	0.53	82.00	0.59	32.00	52.00	0.91	0.89	1.04	0.87	0.12	No difference
Hostility	4.79	4.58	0.82	80.00	0.41	31.00	51.00	0.95	1.21	1.62	0.16	0.19	No difference
Experimentation	5.18	4.73	1.67	86.00	0.10	34.00	54.00	1.27	1.17	1.17	0.59	0.37	No difference
Affordable loss	4.86	5.00	-0.49	86.00	0.62	34.00	54.00	1.54	1.09	2.00	0.02	0.11	No difference
Flexibility	5.46	5.37	0.43	86.00	0.67	34.00	54.00	1.00	1.07	1.15	0.68	0.09	No difference
Pre-commitments	5.24	5.06	0.64	86.00	0.52	34.00	54.00	1.26	1.28	1.03	0.94	0.14	No difference
Proactiveness	5.02	4.78	0.99	86.00	0.33	34.00	54.00	1.25	0.97	1.65	0.10	0.22	No difference
Risk taking	4.57	4.33	0.89	86.00	0.38	34.00	54.00	1.31	1.15	1.30	0.39	0.20	No difference
Innovativeness	4.75	4.06	2.83	86.00	0.01*	34.00	54.00	1.02	1.18	1.34	0.37	0.63	Moderate difference
Performance: Financial	4.42	4.23	0.69	82.00	0.49	32.00	52.00	1.18	1.25	1.12	0.74	0.16	No difference
Performance: Market	4.69	4.78	-0.38	82.00	0.71	32.00	52.00	1.22	0.90	1.81	0.06	0.09	No difference
Performance: Innovativeness	4.76	4.59	0.72	82.00	0.47	32.00	52.00	0.92	1.13	1.50	0.23	0.16	No difference
Hostility: Riskiness	4.60	4.20	1.22	80.00	0.23	31.00	51.00	1.21	1.56	1.66	0.14	0.28	No difference
Hostility: Competition	4.92	4.84	0.28	80.00	0.78	31.00	51.00	1.15	1.38	1.45	0.28	0.06	No difference

* P-value is significant at the 0.01 level (2-tailed)
** P-value is significant at the 0.05 level (2-tailed)

4.8 Structural aspects of the model

4.8.1 Rationale based on correlations

A correlation matrix is computed to assess the relation between variables before regression analysis was conducted and to assess potential multicollinearity. The correlation matrix for our sample is displayed in Table 45. The pairwise correlation coefficients between the independent variables (IVs) seem to indicate multicollinearity is not an issue (Hair et al., 2010).

Further, based on table 45 we observe that correlation coefficients range from -0.23 to 0.90. The correlations are moderate, although some are statistically significant. Cooper and Chandler (2001) suggest correlations above 0.4 are moderate to strong and should be large enough to be statistically significant at p=0.05 or below. In the correlation matrix displayed in table 45, there are 59 significant correlations at p=0.05. The correlation matrix seems to confirm that:

- EO is positively correlated to performance ($r= 0.42$, $p<0.01$),
- Environmental hostility is negatively correlated to financial performance ($r=-0.23$, $p<0.05$)
- Innovativeness is positively correlated to innovative performance ($r= 0.54$, $p<0.01$)

These results seem to further enhance the reliability and the nomological validity of this research.

Table 45: Correlation Matrix

	Effectuation	EO	Performance	Hostility	experimentation	affordable loss)	flexibility	Pre-commitments	Proactiveness	Risk taking	Innovativeness	Financial Perform	Market Perform	Innovative Perform	Riskiness	Competition
Effectuation	1.00															
EO	0.46*	1.00														
Performance	0.17**	0.42*	1.00													
Hostility	0.23**	0.07	-0.06	1.00												
experimentation	0.67*	0.57*	0.18	0.15	1.00											
affordable loss	0.59*	0.02	-0.14	0.18	0.05	1.00										
flexibility	0.76*	0.40*	0.33*	0.22**	0.42*	0.20	1.00									
Pre-commitments	0.58*	0.18	0.04	0.03	0.21**	0.27*	0.27*	1.00								
Proactiveness	0.24**	0.74*	0.29*	0.14	0.26**	0.05	0.27*	0.00	1.00							
Risk taking	0.45*	0.82*	0.29*	0.04	0.54*	-0.01	0.38*	0.25**	0.39*	1.00						
Innovativeness	0.41*	0.83*	0.43*	0.01	0.55*	0.01	0.31*	0.16	0.42*	0.55*	1.00					
Financial Perform	0.06	0.30*	0.90*	-0.17	0.08	0.19	0.22**	0.01	0.22**	0.14	0.35*	1.00				
Market Perform	0.06	0.20**	0.72*	0.02	0.02	-0.13	0.21**	0.04	0.13	0.19	0.16	0.47*	1.00			
Innovative Perform	0.38*	0.56*	0.70*	0.11	0.39*	0.05	0.42*	0.07	0.36*	0.45*	0.54*	0.44*	0.38*	1.00		
Hostility: Riskiness	0.21**	0.04	-0.09	0.76*	0.17	0.16	0.18	0.00	0.02	0.07	0.00	-0.23**	0.09	0.08	1.00	
Hostility: Competition	0.18**	0.08	-0.02	0.87*	0.09	0.14	0.17	0.04	0.18	0.01	0.01	-0.06	-0.04	0.10	0.33*	1.00

* Correlation is significant at the 0.01 level (2-tailed)
** Correlation is significant at the 0.05 level (2-tailed)

4.8.2 Predictive hypotheses- simple regression

As discussed in chapter 3, ordinary least squares (OLS) regression was used to test the hypotheses. The objective of regression analysis is to predict a single dependent variable from the knowledge of one or more independent variables. When the problem involves a single dependent variable, the technique is called simple regression. In the simple regression model the intercept and the coefficient are estimated by minimizing the sum of the least squares. Prediction accuracy was assessed based on the coefficient of determination (R2), which is the ratio of the sum of squares of regression to the total sum of squares. The R2 assess the strength of the relationship, i.e. it indicated the percentage of variance of the dependent variable (DV) that is accounted for by the independent variable (IV).

In this study the IVs are EO, effectuation and its sub-constructs (experimentation, affordable loss, flexibility and pre-commitments) and hostility. The DVs are performance and its sub-constructs financial, market and innovative performance and effectuation and its sub-constructs.

As previously indicated all the cases were grouped and firm size (small number of respondents younger than 3) and level of technology (t-test showed no significant difference) were not used as control variables.

A summary of the regression results is presented in table 46.

4.8.3 Testing hypothesis H1, H1a and H1b

The hypotheses predict a positive relationship between the IV, EO and the DVs, effectuation, experimentation and flexibility. The residual histograms for all three regression models seem to indicate normal, bell-shaped distributions, thus the assumption of normality is confirmed. Further, the residual scatterplots seem to be fairly random, as a result it was concluded that the residuals are independent and have constant variance. In addition, there are no substantial outliers. Consequently, that all three regression models are deemed satisfactory. The R square for H1 (0.21, sig=0.00) suggests that EO accounts for 21% of the variation in effectuation. Likewise, the R square for H1a (0.32, sig=0.00) suggests that EO accounts for 32% of the variation in experimentation. Similarly, the R square for H1b (0.16, sig=0.00) suggests that EO accounts for 16% of the variation in flexibility.

4.8.4 Testing hypothesis H2

The hypotheses predict a positive relationship between the IV, environmental hostility and the DV, effectuation. Normality, independence, the absence of significant outliers and constant variance are confirmed. Consequently, the regression model is deemed acceptable. The R square for H2 (0.05, sig=0.05) suggests that environmental hostility accounts for 5% of the variation in effectuation.

Table 46: A summary of the regression results

Hypothesis	R2 base	significance	Predictor1	Result
H1: EO positively predicts effectuation	0.21*	0.00	EO	**Supported**
H1a: EO positively predicts experimentation	0.32*	0.00	EO	**Supported**
H1b: EO positively predicts flexibility	0.16*	0.00	EO	**Supported**
H2: Hostility positively predicts effectuation	0.05**	0.03	Hostility	**Supported**
H3: EO positively predicts performance	0.18*	0.00	EO	**Supported**
H3a: EO positively predicts financial performance	0.09*	0.00	EO	**Supported**
H3b: EO positively predicts market performance	0.04**	0.05	EO	**Supported**
H3c: EO positively predicts innovative performance	0.32**	0.00	EO	**Supported**
H4: Effectuation positively predicts performance	0.03	0.10	Effectuation	Not supported
H4a: Effectuation positively predicts financial performance	0.00	0.58	Effectuation	Not supported
H4b: Effectuation positively predicts market performance	0.00	0.59	Effectuation	Not supported
H4c: Effectuation positively predicts innovative performance	0.15*	0.00	Effectuation	Supported
H5: Flexibility positively predicts performance	0.11*	0.00	Flexibility	Supported
H5a: Flexibility positively predicts financial performance	0.05**	0.04	Flexibility	Supported
H5b: Flexibility positively predicts market performance	0.04**	0.05	Flexibility	Supported
H5c: Flexibility positively predicts innovative performance	0.18*	0.00	Flexibility	Supported
H6: Experimentation positively predicts performance	0.03	0.10	Experimentation	Not supported
H6a: Experimentation positively predicts financial performance	0.01**	0.46	Experimentation	Supported
H6b: Experimentation positively predicts market performance	0.00	0.86	Experimentation	Not supported
H6c: Experimentation positively predicts innovative performance	0.15*	0.00	Experimentation	Supported
H7: Affordable loss positively predicts performance	0.02	0.19	Affordable loss	Not supported
H7a: Affordable loss positively predicts financial performance	0.03	0.08	Affordable loss	Not supported
H7b: Affordable loss positively predicts market performance	0.02	0.21	Affordable loss	Not supported
H7c: Affordable loss positively predicts innovative performance	0.00	0.65	Affordable loss	Not supported
H8: Pre- commitments positively predicts performance	0.00	0.70	Pre-commitments	Not supported
H8: Pre-commitments positively predicts financial performance	0.00	0.92	Pre-commitments	Not supported
H8: Pre-commitments positively predicts market performance	0.00	0.72	Pre-commitments	Not supported
H8: Pre-commitments positively predicts innovative performance	0.01	0.49	Pre-commitments	Not supported

* P-value is significant at the 0.01 level (2-tailed)
**P-value is significant at the 0.05 level (2-tailed)

4.8.5 Testing hypothesis H3, H3a, H3b and H3c

The hypotheses predict a positive relationship between the IV, EO and the DVs, performance, innovative performance, financial performance and market performance. Normality, independence, the absence of significant outliers and constant variance are confirmed. Consequently, all four regression models are deemed satisfactory. The R square for H3 (0.18, sig=0.00) suggests that EO accounts for 18% of the variation in the aggregated performance construct. Likewise, the R square for H3a (0.09, sig=0.00) suggests that EO accounts for 9% of the variation in financial performance. Similarly, the R square for H3b (0.04, sig=0.05) suggests that EO accounts for 4% of the variation in market performance. Lastly, the strongest relationship seems to be between EO and innovative performance (R2= 0.32, sig= 0.00) with EO explaining 32% of the variation in innovative performance.

4.8.6 Testing hypothesis H4, H4a, H4b and H4c

The hypotheses predict a positive relationship between the IV, effectuation and the DVs, performance, innovative performance, financial performance and market performance. Normality, independence, the absence of significant outliers and constant variance are confirmed. Consequently, all four regression models are deemed satisfactory. The R square for H4 (0.03, sig=0.10) suggests that the null hypothesis that effectuation has no impact on performance cannot be rejected. Likewise, the R squares for H4a and H4b suggest the null hypotheses cannot be rejected. However, the R square for H4c (0.15, sig=0.00) suggests that effectuation accounts for 15% of the

variation in innovative performance. This relationship is moderately strong and significant.

4.8.7 Testing hypothesis H5, H5a, H5b and H5c

The hypotheses predict a positive relationship between the IV, flexibility and the DVs, performance, innovative performance, financial performance and market performance. Normality, independence, the absence of significant outliers and constant variance are confirmed. Consequently, that all four regression models are deemed satisfactory. The R square for H5 (0.11, sig=0.00) suggests that flexibility explains 11% of the variation in performance. Likewise, the R square for H5a, H5b and H5c suggests that flexibility accounts for variation ranging from 4% to 15% in the sub-constructs of performance. These relationships are moderately strong and significant.

4.8.9 Testing hypothesis H6, H6a, H6b and H6c

The hypotheses predict a positive relationship between the IV, experimentation and the DVs, performance, innovative performance, financial performance and market performance. Normality, independence, the absence of significant outliers and constant variance are confirmed. Consequently, all four regression models are deemed satisfactory. The R square for H6 (0.03, sig=0.10) suggests that the null hypothesis that experimentation has no impact on performance cannot be rejected. Likewise, H6b. H6a had a small but significant impact. In contrast, the R square for H6c suggests that experimentation accounts for 15% of the variation innovative performance. This relationship is moderately strong and significant.

4.8.10 Testing hypothesis H7, H7a, H7b and H7c

The hypotheses predict a positive relationship between the IV, affordable loss and the DVs performance, innovative performance, financial performance and market performance. The R squares for H7, H7a, H7b and H7c suggests that the null hypothesis that affordable loss has no impact on performance cannot be rejected. However, interestingly affordable loss seems to explain 3% of the variation in financial performance and this is significant at 10% level.

4.8.11 Testing hypothesis H8, H8a, H8b and H8c

The hypotheses predict a positive relationship between the IV, pre-commitments and the DVs, performance, innovative performance, financial performance and market performance. The R squares for H8, H8a, H8b and H8c suggests that the null hypothesis that pre-commitments have no impact on performance cannot be rejected.

To sum up, there are some significant results found between the DVs and the IV's. Firstly, EO positively predicts effectuation and its sub-constructs experimentation and flexibility. Secondly, the EO-performance relationship is confirmed. Thirdly, hostility is positively linked to effectuation. Further, flexibility is demonstrated to positively predict performance and all its' sub-constructs and experimentation is positively linked to innovative performance. Lastly, the formative construct effectuation is positively linked to innovative performance.

4.9 Testing the moderation hypotheses

The hypothesis H9, H9a, H9b, H10, H10a, H10b, H10c and H10d were tested. As we alluded to in Chapter 3, Hair et al. (2010) suggest we follow a three step process to determine whether the moderator effect is significant:

- Estimated the original unmoderated equation
- Estimated the moderated relationship
- Assess the change in R2. If the incremental effect is significant then a significant moderator effect is present.

The researcher also assessed the change in the Beta coefficients (B weight). Regression coefficients provide a means for assessing the relative importance of the individual variables in the overall prediction of the dependent variable. However, the variability across variables and differing response scales makes direct comparisons problematic (Hair et al., 2010). The Beta coefficient is a standardized regression coefficient that allows for a direct comparison between coefficients as to their relative explanatory power (Hair et al., 2010).

Table 47 displays the summary of the moderation results. Only those tests that showed any significance are reported.

4.9.1 Testing hypothesis H9, H9a and H9b (Hostility as moderator)

The hypothesis predicts a moderated relationship between the IV- effectuation, the moderator- environmental hostility and the DV- innovative performance. The researcher

first entered effectuation and hostility into the regression. The interaction item was included in the second step. Normality, independence, the absence of significant outliers and constant variance are confirmed. Consequently, that two regression models are deemed satisfactory. The change in R square from the base model was 0.2%. Further, the interaction effect, Effectuation*Hostility, was not significant (p=. 0.67). However, there was a slight change in the slope of effectuation from 0.37 to 0.53. These results suggest that we cannot reject the null hypothesis that hostility has no impact on the relationship between effectuation and innovative performance.

Furthermore, H9a which posits that hostility moderates the relationship between experimentation and innovative performance was tested. The assumptions of regression were met and the regression models were deemed satisfactory. The change in R square from the base model was 1, 2%. In addition, the interaction effect, Experimentation*Hostility, was not significant (p=. 0.27). The beta coefficient of experimentation actually declined from 0.38 to 0.29. Thus, based on these results, we cannot reject the null hypothesis that hostility does not moderate the relationship between experimentation and innovative performance.

Lastly, hostility was also examined as a potential moderator of the relation between flexibility and innovative performance. As with effectuation and experimentation, we confirmed normality, independence, the absence of significant outliers and constant variance. The change in R square from the base model was 0,2%. In addition, the interaction effect, Flexibility*Hostility, was not significant (p=. 0.27). The beta coefficient of experimentation slightly increased from 0.42 in the base model to 0.64 in the moderated regression. These results suggest the null hypothesis, that hostility does not

moderate the relationship between flexibility and innovative performance, cannot be rejected.

4.9.2 Testing hypothesis H10, H10a, H10b and H10c (Effectuation as moderator)

The researcher also tested whether effectuation and its sub-constructs moderate the relationship between EO and performance. In H10 EO was the IV, effectuation the moderator and innovative performance the DV. We first entered effectuation and EO into the regression and the regression was significant (R2= 0.34, p=0). The interaction item was included in the second step and the regression was also significant (R2= 0.41, p=0). The change in R square from the base model was 7.1%. In addition, the interaction effect, EO*Effectuation, was significant (p= 0.00). The beta coefficient of EO increased substantially from 0.49 in the base model to 1.19 in the moderated regression. The results clearly indicate that effectuation moderates the relation between EO and innovative performance. The explained variance increases to a notable 40, 66%.

The researcher proceeded to test experimentation as a moderator of the relationship between EO and innovative performance. In H10a EO was the IV, experimentation the moderator and innovative performance the DV. Firstly, we entered experimentation and EO into the regression and the regression was significant (R2= 0.32, p=0). Secondly, the interaction item was included and the regression was also significant (R2= 0.36, p=0). The change in R square from the base model was smaller than the comparable impact of effectuation at 4.2%. In addition the interaction effect, EO*Experimentation, was significant (p= 0.02). The beta coefficient of EO increased substantially from 0.51 to

1.14. The results clearly indicate that experimentation moderates the relation between EO and innovative performance. The explained variance increases to a significant 36, 5%.

Table 47: Summary of Moderation results

H9	Moderation	R2 base	ΔR2	Change in b weight	Interaction effect sig	Predictor1	Predictor2	Predictor3
		0.143	0.002	Effectuation: from 0.37 to 0.53		Effectuation	Hostility	Effectuation*Hostility
H9a	**Moderation**	**R2 base**	**ΔR2**	**Change in b weight**	**Interaction effect sig**	**Predictor1**	**Predictor2**	**Predictor3**
		0.16	0.012	Experimentation: from 0.38 to 0.29		Experimentation	Hostility	Exp*Hostility
H9b	**Moderation**	**R2 base**	**ΔR2**	**Change in b weight**	**Interaction effect sig**	**Predictor1**	**Predictor2**	**Predictor3**
		0.18	0.006	Flexibility: from 0.42 to 0.64		Flexibility	Hostility	Flex*Hostility
H10	**Moderation**	**R2 base**	**ΔR2**	**Change in b weight**	**Interaction effect sig**	**Predictor1**	**Predictor2**	**Predictor3**
		0.34	0.071	EO : from 0.49 to 1.19	**	EO	Effectuation	EO*Effectuation
H10a	**Moderation**	**R2 base**	**ΔR2**	**Change in b weight**	**Interaction effect sig**	**Predictor1**	**Predictor2**	**Predictor3**
		0.32	0.042	EO: from 0.51 to 1.14	*	EO	Experimentation	EO*Exp
H10b	**Moderation**	**R2 base**	**ΔR2**	**Change in b weight**	**Interaction effect sig**	**Predictor1**	**Predictor2**	**Predictor3**
		0.32	0.058	EO from: 0.56 to 1.43	**	EO	Affordable loss	EO*AffLoss
H10c	**Moderation**	**R2 base**	**ΔR2**	**Change in b weight**	**Interaction effect sig**	**Predictor1**	**Predictor2**	**Predictor3**
		0.36	0.041	EO: from 0.49 to 1.19	*	EO	Flexibility	EO*Flex
H10d	**Moderation**	**R2 base**	**ΔR2**	**Change in b weight**	**Interaction effect sig**	**Predictor1**	**Predictor2**	**Predictor3**
		0.32	0.005	EO: from 0.59 to 0.29		EO	Pre-commitments	EO*Part

* Significance at the 0.05 level (2-tailed)
** Significance at the 0.01 level (2-tailed)

Affordable loss was also tested as a moderator of the EO-innovative performance relationship. Affordable loss has hardly had a significant relation with any of the

performance constructs. In H10b EO was the IV, affordable loss the moderator and innovative performance the DV. Firstly, the researcher entered affordable loss and EO into the regression and the regression was significant (R2= 0.32, p=0). Secondly, the interaction item was included and the regression was also significant (R2= 0.38, p=0). The change in R square from the base model was higher than the comparable impact of experimentation at 5.8%. In addition the interaction effect, EO*Affordable loss, was significant (p= 0.01). The beta coefficient of EO increased substantially from 0.56 to 1.43. Thus we can surmise that affordable loss moderates the relation between EO and innovative performance. The explained variance increases to an impressive 37, 68%.

The effectuation sub-construct flexibility has been positively associated with all the performance constructs. The researcher proceeded to investigate whether it is also a moderator of the EO-innovative performance relationship. In H10c EO is the IV, flexibility the moderator and innovative performance the DV. The regression of the main effects, EO and flexibility was significant (R2= 0.36, p=0). Secondly, the interaction item was included and the regression was also significant (R2= 0.40, p=0). The change in R square from the base model was similar to the impact of experimentation at 4.1%. In addition the interaction effect, EO*Flexibility, was significant (0.00). The beta coefficient of EO increased substantially from 0.47 to 1.19. The explained variance increases to an impressive 40.34%, just slightly below that of effectuation as a moderator.

Lastly, the researcher tested the effectuation sub-construct pre-commitments as a moderator of the EO-innovative performance relationship. In H10d EO is the IV, pre-commitments the moderator and innovative performance the DV. The regression of the main effects, EO and pre-commitments, was not significant and the regression with

interaction item was also not significant. The change in R square from the base model was 0.5%. In addition the interaction effect, EO*Pre-commitments, was not significant (p=0.44). The beta coefficient of EO declined substantially from 0.57 to 0.29. These results suggest the null hypothesis that pre-commitments do not moderate the relationship between EO and innovative performance cannot be rejected.

Chapter 5: Discussion of the findings

5.1 introduction

This chapter presents the discussion of the findings of the study. The results from the quantitative study are integrated with the literature review. Firstly, the demographic profile of the respondents is discussed, then the results of the hypothesis are reviewed and finally the implications of the findings are discussed. The chapter concludes with a summary of the key findings.

5.2 Demographic profile of the respondents

As alluded to in chapter 4, the majority of the respondents (95.7%) were formed before 2008, over 44% of the responding firms employ more than 350 people, 98% of our respondents were senior executives and seven of the respondents indicated that their firm was low tech, 54 catergorised their firm as medium tech and 34 reported their firm as high tech.

The level of technological advancement was meant to be one of the main control variables. T-tests were conducted to determine where there was a significant difference in strategy and performance between high tech and meduim tech. However, the results indicated no such difference on the main dependent variables effectuation and performance. There was a slight difference on EO and innovatiness though. Contrary to our expectations, this difference did not translate into performance outcomes, even innovative performance. This might be due to the cross sectional nature of the study. Perhaps a longitudinal study might find different results.

5.3. Discussion of hypothesis

5.3.1 Discussion of hypothesis H1, H1a and H1b

The hypotheses predicted a positive relationship between the EO and effectuation and its sub-constructs experimentation and flexibility. They were all supported. As expected all EO dimensions, i.e. risk taking, proactiveness and innovativeness, had a positive relation with effectuation and its sub-constructs experimentation and flexibility. In the following paragraphs, we shall discuss how each EO constructs relate to effectuation, integrating the results with theory.

Firstly, we argued in Chapter 2 that the innovation element of EO relates directly to effectuation and creation theory. For, as Sarasvathy et al. (2003) questioned, how do firms recognize or discover innovation? They argued that innovation is influenced by the judgments and deeds of agents and results in novel goals and new environments from current realities. Further, Brettel et al. (2012) have also suggested that successful innovative entrepreneurs maintain flexibility, utilize experimentation and the affordable loss principle and have a preference for partnerships and leverage contingencies. In sum, we find support for creation theory due to the strong association between innovativeness and effectuation.

Secondly, we supported the notion advanced by Wiklund and Shepherd (2011) that the risk taking element of EO appears to be more closely aligned with the activities of exploration than exploitation. The effectuation sub-constructs pre-commitments; flexibility and experimentation were all significantly correlated with risk taking. Emphasizing flexibility, pre-commitments and experimentation positively influences the

costs and risks of firm strategies (Witlbank et al., 2006). In an effectual context, successes and failures are inputs into a process that needs to be managed such that failures are outlived and successes are accumulated (Sarasvathy, 2001). Thus, rather than viewing entrepreneurial firms as speculators who discover opportunities, the effectuation and creation theory perspective might be more apt. As Barney (1991) suggests, entrepreneurs build sustainable, inimitable enterprises with a competitive advantage. They do not merely assume risks based on opportunities they discover, but they also create them through experimenting and by being flexible, whilst using pre-commitments to manage the risk that venturing entails. In sum, we find support for Wiklund and Shepherd's (2011) view that the risk taking element of EO appears to be more closely aligned with the activities of exploration, rather than exploitation, due to the strong association between risk taking and effectuation. Further, Sarasvathy's effectuation theory seems to provide a plausible explanation of how they manage the attendant threats.

Thirdly, proactiveness was also strongly correlated with effectuation, experimentation and flexibility. Miller and Friesen (1978) argued that the proactiveness of a firm's decisions is determined by whether it shapes the environment by initiating new products, technologies, administrative techniques or whether it just reacts. By experimenting and being flexible as they act, entrepreneurial firms introduce new products and brands ahead of competition and strategically eliminate operations which are mature (Venkatraman, 1989). Further, Anderson et al. (2009) suggest EO encourages firms to undertake experimentation and exploration activities leading to new venture creation. Lastly, new combinative and exploitative knowledge is largely

developed through proactive behaviors (Li et al., 2009) and the results imply, by being flexible and experimenting. In sum, proactiveness may be viewed not only as a method of recognizing opportunities but also as a way of creating them through effectuation.

Finally, empirically, of the effectuation sub-constructs, experimentation had the strongest association (r=0.57, p=0.00) with EO. Accordingly, Wiklund and Shepherd's (2011) proposition of EO-as-experimentation—reflecting the notion that EO is concomitant with greater outcome variance, which increases the likelihood of both failure and success-, is supported based on the strong relation between experimentation and EO.

5.3.2 Discussion hypothesis H2

The hypothesis predicts a positive relationship between environmental hostility and effectuation. The hypothesis was supported. The R square for H2 (0.05, sig=0.05) suggests that environmental hostility accounts for 5% of the variation in effectuation. Further, environmental hostility was positively correlated with flexibility whereas there was no correlation with experimentation, affordable loss and pre-commitments and EO or its sub-constructs. The results seem to support Peng's (2001) view that prospecting, networking and boundary blurring, which by definition imply flexibility, are strategies entrepreneurs use in emerging markets to shape the environment. Sirmon et al. (2007) have also suggested that firms are flexible enough to adapt in hostile environments by transforming unique resources to create value while considering environmental contingencies (Sirmon et al., 2007). In sum, in a hostile environment firms are more likely to deploy effectual strategies to shape the environment.

5.3.3 Discussion hypothesis H3, H3a, H3b and H3c

The hypotheses predict a positive relationship between EO and performance, innovative performance, financial performance and market performance. They were all supported. EO showed positive associations with all the performance dimensions and as Raunch et al. (2009) have suggested the EO-performance relationship remains vigorous to modifications in performance dimensions, common method variance and memory decay or social desirability. Further, Raunch et al. (2009) suggested that based on their meta-analysis, the "true" correlation between EO and firm performance is .242. In contrast, Tang and Tang (2010) found a curvilinear, inverse U shaped relationship between EO and performance amongst Chinese firms. However, we found a correlation 0.42 with the aggregated performance measure and a linear relationship. The results seem to imply that there might be greater returns to having a higher EO in South Africa. This may possibly be due to the country being an emerging market with a Western institutional framework. Thus there are more opportunities to exploit within a legal frame work resulting in linear and higher returns to entrepreneurial behaviour.

5.3.4 Discussion hypothesis H4, H4a, H4b and H4c

The hypotheses predict a positive relationship between effectuation and performance, innovative performance, financial performance and market performance. The hypotheses for performance, financial performance and market performance were not supported. However, the R square for innovative performance (0.15, sig=0.00) suggests that effectuation accounts for 15% of the variation in innovative performance. This supports the notion that innovativeness is crucial because it can lead to the

development of new organizational competences through the process of trial-and-error and creativity (Covin, Green and Slevin, 2006; Lumpkin and Dess, 1996). Moreover, innovative firms utilize new ideas and products, as well as new technological processes, to develop new products, processes and/or markets (Covin, Green and Slevin, 2006; Lumpkin and Dess, 1996). The results also support Dew et al.'s (2008) view that established firms could use effectuation to address Christensen's (2000) "Innovators' dilemma". In addition, Brettel et al.'s (2012) suggestion that those large companies which have difficulties in executing highly innovative R&D use an effectual approach and Venkantaraman and Sarasvathy's (2001) argument that innovation managers should use effectuation to improve innovative performance, are both supported. In sum, an effectual approach supports the commercialisation of new products/services.

However, other scholars have noted that innovative performance might not have positive short-term financial outcomes, supporting the findings of this study. Eisenhardt and Martin (2000) have suggested that innovative performance enhances uncertainty. Further Block and MacMillan (1993) have suggested it might imply short-term losses. Nevertheless, Schumpeter (1934) contends that over the long-term innovative performance bestows monopoly rents and spawns enduring entrepreneurial success.

5.3.5 Discussion hypothesis H5, H5a, H5b and H5c

The hypotheses predict a positive relationship between flexibility and performance, innovative performance, financial performance and market performance. The hypotheses were all supported. Flexibility implies disregarding predictions about an uncertain future or at a minimum treating them cautiously. Sarasvathy (2001a, 2001b)

has emphasized the importance of control and flexibility and rejected the notion that only prediction can improve performance. Chandler et al. (2011) has suggested that an effectual entrepreneur maintains flexibility, utilizes experimentation and seeks to exert control to shape an uncertain future. In addition, Sarasvathy (2001a, 2001b) has maintained that whereas predictive strategies are ways to influence current realities to reach preselected goals, effectual strategies spawn novel goals and new environments from current realities. Further, Venkantaraman and Sarasvathy (2001) argue that firms should not try to predict technology paths more accurately or strive to build immortal firms in mortal markets rather they should remain flexible and adaptable enough to create new markets. These arguments are supported by the results which indicate that those firms which disregard prediction and are flexible achieve better performance outcomes across all dimensions of performance.

5.3.6 Discussion hypothesis H6, H6a, H6b and H6c

The hypotheses predict a positive relationship between experimentation and performance, innovative performance, financial performance and market performance. H6, H6a and H6b were not supported. In contrast, the R square H6c suggests that experimentation accounts for 15% of the variation innovative performance. The researcher has argued that performance is a multidimensional construct and in this study, he has also adopted Chandler et al.'s (2011) view that effectuation is a multi-dimensional formative construct. Effectuation sub-constructs do not need to co-vary and further they each provide a unique dimension to the effectuation construct. Thus, in the short term experimenting might be costly and lead to a deterioration in financial performance. However, in the long term, through its impact on innovative performance,

better financial and market outcomes may result. Richard et al. (2009) caution against using short- or medium-term measures since they can be heavily biased by random fluctuations, performance itself does not persist indefinitely and they fail to account for the variability and stickiness in performance.

5.3.7 Discussion hypothesis H7, H7a, H7b and H7c

The hypotheses predict a positive relationship between affordable loss and performance, innovative performance, financial performance and market performance. The hypotheses were not supported at the 5% significance level. However, interestingly affordable loss seems to explain 3% of the variation in financial performance and this is significant at 0.1. Similarly, effectuation received support at a similar level. As we have argued ad nauseam, effectuation is a formative, multidimensional construct. Chandler et al. (2011) suggest we view it as a composite index. Each sub-construct seems to explain a unique element of effectuation, and affordable loss seems to relate to financial performance. Further, a construct like effectuation that seems to emphasize experimentation and flexibility might immediately impact negatively on short term financial measures. In addition, a risk mitigation strategy such as affordable loss might relate more towards ensuring long-term survival rather than optimizing short-term performance outcomes. A longitudinal study that incorporates both failure and success as the DVs might be more appropriate for explicating the affordable loss sub-construct's performance implications.

5.3.8 Discussion hypothesis H8, H8a, H8b and H8c

The hypotheses predict a positive relationship between the IV, pre-commitments and the DVs, performance, innovative performance, financial performance and market performance. The hypotheses were all not supported. However, these results should be interpreted with caution. The instrument adapted from Chandler et al. (2011) had reliability problems on the pre-commitment scale. Similar to Chandler et al. (2011), we found a Cronbach's alpha of 0.6. Hair et al. (2010) suggest a minimum of 0.7 for our sample size. Further, as we have argued, effectuation is a formative construct and the one significant correlation pre-commitments had was with the EO sub-construct, risk taking. Perhaps, as conjecture, it could be argued that effectual entrepreneurs do not use pre-commitments to maximise performance, but rather to manage risk by spreading it out amongst different partners. Further, the effectiveness of forming partnerships and strategic alliances might be better illustrated over a longer period and might relate positively to a different DV, survival. As with the affordable loss construct, a longitudinal study might better clarify the performance implications of the pre-commitments sub-construct.

5.3.9 Discussion hypothesis H9, H9a and H9b (Hostility as moderator)

The hypotheses predict a moderated relationship between effectuation and its sub-constructs flexibility and experimentation, environmental hostility and innovative performance. Effectuation and flexibility resulted in a small increase in the beta coefficient whereas experimentation did not. All moderation effects were not significant. Dew et al. (2008) have argued that entrepreneurial firms transform hostile environments

in contrast to operating within existing environments. Lau and Bruton (2011) suggest that entrepreneurs and the firms they establish produce prosperity in locations conventionally hostile to enterprise. Lau and Bruton (2011) posit that effective strategies in an emerging market should strengthen the firm's capabilities to produce more innovative products and processes especially in industries which commonly rely on differentiation. Peng (2001) suggests that they achieve this feat through prospecting, networking and boundary blurring. This would suggest that environmental hostility would moderate the effectuation-performance relation. However, the results suggest otherwise.

The researcher did not find significant moderation even though he did find significant correlation between environmental hostility and performance. Similarly, the relation between environmental hostility and EO has invited considerable debate (Rauch et al., 2010). Theory suggests that environmental hostility should moderate the effectuation performance relation and indeed we were able to empirically link environmental hostility to effectuation. However, the results suggest otherwise. It begs the question: why are entrepreneurial firms in hostile environments more likely to effectuate if there is no concomitant improvement in performance? Perhaps effectual strategies might enhance their chances of survival. We are only speculating and only future research can help explicate this dilemma.

5.3.10 Discussion hypothesis H10, H10a, H10b and H10c (Effectuation as moderator)

Effectuation and its sub-constructs were tested as moderators of the relationship between EO and performance. Effectuation, flexibility, experimentation and affordable

loss were found to be moderators. As discussed in chapter 4, all interaction effects were found to be significant. Similar to its relation with environmental hostility, effectuation was found to have the largest moderation effect. This once again seems to confirm the view that, in certain instances, effectuation seems to be greater than the sum of its parts. The change in R square from the base model was 7.1%. The explained variance increased to a notable 40, 66%. Thus EO and the moderator effectuation explain 40.66% of the variance in innovative performance. This seems to lend credence to the Vankantaraman and Sarasvathy's (2011) view of effectuation as the entrepreneurial method.

As previously elucidated in the review of literature, creation theory suggests opportunities are endogenously created by the actions of entrepreneurs exploring ways to produce new products or services (Baker and Nelson, 2005; Sarasvathy, 2001). Sarasvathy et al. (2003) suggest that entrepreneurial opportunities are created. Dew et al. (2008) postulate that the key difference between entrepreneurial firms and existing firms is that firms and markets are not assumed as exogenous in entrepreneurship. Sarasvathy (2001a, 2001b) suggest effectuation facilitates technology commercialization – i.e. investing in and building new markets. Barney (1991) emphasizes the importance of information, learning and knowledge generated from the process of enacting an opportunity. Firms that own resources that are valuable and rare attain a competitive advantage and enjoy improved performance in the short term. To sustain these advantages over time the firm's resources must also be inimitable and non-substitutable (Barney, 1991). We argue that resources that are inimitable and non-substitutable can only be attained through innovative performance.

This line of argument finds support from Porter (1980) who has posited that innovative entrepreneurial firms differentiate themselves from competitors, enjoy higher customer loyalty and can secure superior pricing for their products and that through innovative performance entry barriers for prospective challengers can be erected and the firm's position in the industry strengthened leading to continual high profits (Porter, 1980). Similarly, Kim and Maubourgne (2005) have suggested that firms need to innovate in order to endure and flourish in global markets. Lastly, Schumpeter (1934) has posited that innovative performance bestows monopoly rents and spawns enduring entrepreneurial success.

The central thesis of this study has been that effectuation helps entrepreneurial firms attain competitive advantage. How? By moderating the relation between entrepreneurial behaviour (EO) and innovative performance to such an extent that 40, 66% of the variance in innovative performance, is explained.

5.4 Discussion of significant findings

Effectuation was the main construct of this thesis. We adopted Chandler et al.'s (2011) characterization of effectuation as a formative multi-dimensional construct with four associated sub-constructs: experimentation, affordable loss, flexibility and pre-commitments. This characterization was supported by the results of a MTMM analysis which indicated low inter-item correlations between some of the effectuation sub-constructs. Further, exploratory factor analysis was conducted and the factors loaded cleanly on the four sub-constructs, hence providing support for Chandler et al.'s (2011) conclusions. However, similar to Chandler et al. (2011), the pre-commitment scale was

less robust. We would suggest researchers should develop alternative scales to measure the pre-commitments sub-construct. In addition, effectuation was positively associated with environmental hostility, which indicated fairly good predictive validity and the formative construct had a larger moderating impact on the EO-performance relation than any of its sub-constructs, indicating that it may very well be a composite index that explains more than the sum of its parts.

We also sought to establish whether, in a hostile environment, firms were more likely to use effectual principles. Sarasvathy (2001a, 2001b) has argued under conditions of hostility, casual strategies are impractical since it is impossible to predict the future with confidence. She has suggested that the entrepreneur utilises flexibility, experiments and forms strategic alliances to shape the environment. As indicated in the previous paragraph, through regression analysis, this argument was supported. In fact, effectuation and its sub-construct flexibility were the only constructs positively associated with environmental hostility.

Further, the impact of an effectual strategy on performance was assessed. Effectuation was positively linked with innovative performance. Moreover, effectuation was shown to moderate the relationship between EO and innovative performance. This impact might be crucial since innovative performance can lead to the development of new organizational competences through the process of trial-and-error and creativity (Covin et al., 2006). In addition, innovative firms utilize new ideas and products, as well as new technological processes, to develop new products, processes and/or markets (Covin et al., 2006). As the researcher argued in Chapter 2, it is this very process that leads to a competitive advantage.

Lastly, effectuation was also positively linked to EO. EO was viewed as a firm-level trait that can be deciphered through the display of sustained innovation, risk taking and action (Covin and Lumpkin, 2011). This is consistent with the arguments of Miller (1983) and Covin and Slevin (1989). In Chapter 4, the researcher sought to determine whether EO and effectuation were distinct. Exploratory factor analysis was conducted and the results showed that effectuation sub-constructs are distinct from EO. Seven factors were extracted representing: experimentation, affordable loss, flexibility, pre-commitments, proactiveness, risk taking and innovativeness. With discriminant validity established, we proceeded to answer the question: do firms effectuate as they innovate, take risks and act? The results of the regression analysis were affirmative. They do.

5.5 Conclusion

In summary, both the moderation and the predictive hypothesis show significant results. With the predictive hypothesis it has been shown that:

- EO positively predicts effectuation and its sub-constructs experimentation and flexibility.
- The EO-performance relationship is confirmed.
- Hostility is positively linked to effectuation.
- Flexibility positively predicts performance and all its sub-constructs.
- Experimentation positively predicts innovative performance
- Effectuation positively predicts innovative performance.

Further, the moderation results empirically show that effectuation, experimentation, flexibility and affordable loss all moderate the relation between EO and innovative performance. Pre-commitment was found not to be a significant moderator. Environmental hostility could also not be confirmed as a moderator of the effectuation-innovative performance relation.

Chapter 6: Conclusions of the study

6.1 Introduction

In this chapter we expand on the conclusions of the study. Further, the theoretical, managerial and policy contributions of the research are explained. In addition, the limitations of the research are addressed and future research directions are suggested.

6.2 Conclusions of the study

This thesis examined the impact of strategy pursued and the resultant impact on performance in a hostile environment. As outlined in Chapter 1, technological innovation is increasingly important to developing countries such as South Africa. The objective of the study was to fill a research gap suggested by Rauch et al. (2009) in that there is limited research addressing the moderating impact on EO of effectuation in firms operating in a hostile environment and the resultant impact on performance. The study also addressed a research gap suggested by Perry et al. (2011) in terms of exploring relationships between effectuation and established entrepreneurship and management theories such as EO and environmental hostility

In brief, the important findings of this study are that there is no difference between high technology and medium technology South African firms in performance across all dimensions and in the use of effectuation. For the sample as a whole, it was found that firms with a higher EO were more likely to effectuate and be flexible and experiment. Further, a high EO would result in better performance outcomes across all the performance dimensions. Likewise, South African firms that are more flexible achieve

better performance outcomes across all the dimensions of performance. In addition, the more competitive and hostile the environment was, the more likely were firms to effectuate. Further, experimentation and effectuation were positively linked to innovative performance.

However, firms that operated in a hostile environment and used an effectual strategy were found not to achieve better performance outcomes. In contrast, firms with a high EO that used effectual principles were shown to achieve better innovative performance.

6.3 Advancement of creation theory and effectuation

As was indicated in Chapter 1, entrepreneurship literature can be divided into two strands of thought: discovery theory and the creation theory (Alvarez and Barney, 2007). This study makes an important contribution to creation theory. As we have elucidated in Chapter 2, opportunity is the central construct of entrepreneurship theory (Venkataraman, 1997). Creation theory assumes that the entrepreneur's actions are the essential source of these opportunities. In this model, entrepreneurs do not wait for exogenous shocks to form opportunities and then provide agency to those opportunities. They act (Baker and Nelson, 2005; Sarasvathy, 2001). Entrepreneurial firms use an effectual logic that is transformative without calling for prediction or vision in creating new markets and new environments. As highlighted by the results, it seems as if entrepreneurial firms do not only discover opportunities but they also create them through innovative performance.

Further, we have sought to answer the question in RBV theory of how firms develop a competitive advantage. Based on the results, it would seem that firms innovate, take

risks and are proactive whilst deploying effectual principles. As that process evolves differently for various entrepreneurs, the opportunities that result may be heterogeneous in "costly-to-copy, and costly-to-reverse" ways (Barney, 1991, p.105). Entrepreneurial firms explicitly implement such a co-creation process—that is, they act and behave in ways that generate a competitive advantage (Sarasvathy, 2001a, 2001b). Thus, firms that effectuate as they innovate, take risks and act are more likely to achieve superior innovative performance that would lead to resources that are valuable, rare, inimitable and non-substitutable (Barney, 1991) and secure monopoly rents, spawning enduring entrepreneurial success (Schumpeter, 1934). Superior innovative performance might be the only way for firms to survive and thrive in hypercompetitive global markets (Kim and Maubourgne, 2005).

The study also made an important contribution to effectuation theory by demonstrating a positive association between established entrepreneurship and management theories such as EO and environmental hostility. Through factor and MTMM analysis it was established that effectuation is distinct from EO and environmental hostility. Regression analysis was used to establish the causal link.

Furthermore, the researcher addressed the performance implications of effectuation and its sub-constructs. Effectuation was more strongly associated with the innovative performance dimension of the performance construct. Innovativeness is a critical sub-construct of entrepreneurial orientation (EO) and EO has been shown in literature to be positively related to performance (Raunch et al., 2009). We also confirmed Brittle et al.'s (2011) view that those companies which have difficulty with innovative outcomes could benefit from an effectual approach. In addition, it was established that for firms with a

high EO, effectuation, flexibility, affordable loss and experimentation positively moderate the EO-innovative performance relation.

Finally, Wiklund and Shepherd's (2011) EO-as-experimentation perspective was confirmed. Firms with a high EO were more likely to experiment, be flexible, freely associate and enter into new product markets (Raunch et al., 2009).

6.4 Managerial Contributions

In addition to theoretical advances this research has highlighted key areas that could improve management practice:

- Managers should adopt EO as behaviour to improve financial, market and innovative performance
- Managers should be flexible to improve financial, market and innovative performance
- Managers should experiment and use effectual principles to achieve better innovative performance, i.e. commercialise new products and services.

These contributions to management practice are practical and relevant for managers who seek to attain better performance outcomes, in particular commercialising innovations. The rapid changes in technology and markets make attaining innovation success an imperative. In sum, the findings of this study suggest that managers should put an emphasis on EO whilst deploying effectual principles to launch new products and services and build new markets.

6.5 Policy Contributions

As discussed in Chapter 1, South Africa is blighted by high levels of unemployment and poverty. South Africa is ranked 121st out of 177 countries with an HDI score of 0.674 (Venter et al., 2007). Entrepreneurship and particularly technology entrepreneurship has been seen as a possible solution to generate innovation, grow the economy and create jobs, thus reducing poverty. The government has launched a wide array of initiatives: the Technology Innovation Agency (TIA), SEDA Technology Programme (STP), the National Technology Transfer Centre (NTTC), the Industrial Development Corporations' (IDC) Venture Capital Fund and the Jobs Fund. The 2007 OECD review of the NSI indicates that South Africa is a world leader in research in fields such as environment/ecology, social science, engineering, plant and animal sciences and clinical medicine (OECD Innovation Review, 2007). However, the country has struggled to commercialise its research output. Even though many statistics that typically measure knowledge economy progress have improved from the 1990s, South Africa still trails other middle-income countries (Lorentz, 2009).

The empirical evidence of this study suggests that policy makers should review how they allocate funding to technology commercialisation. Rather than focusing on business plans and financials, they should give technology firms more latitude so that they can experiment and be flexible in launching new innovations or in building new markets.

Further, policy makers themselves should use effectual principles to experiment, maintain flexibility, form partnerships and use the affordable loss principle. The use of

effectual principles would suggest more technology commercialisation should be funded, fewer resources be committed per venture and pre-commitments should also be secured from self-selecting stakeholders. In sum, the empirical evidence from this thesis suggests that policy makers should encourage risk taking, pro-activeness and innovativeness by firms who experiment, are flexible and effectuate.

This would imply that accelerated depreciation schedules could be helpful. Further, tax credits for research and funding through grants could ameliorate some of the costs incurred whilst launching new products and/or services, or building new markets.

Lastly, policymakers need to address the culture pervasive in a government that fears failure, since experimenting necessarily entails possibly failing. Some experiments may work, others may not. Thus without accepting failure as a necessary input in technology commercialisation, policy makers might not attain the desired success.

In sum, through deploying effectual principles, accepting failure and encouraging, through the tax code, experimentation and flexibility, policy makers might achieve the stated objective of encouraging technology commercialisation.

6.6 Limitations of the Study

As mentioned in previous chapters, this study had several limitations. They are as follows:

- We have used a quantitative methodology. As far as the researcher is aware, this is the first such study to investigate the moderating impact of effectuation. A mixed methods approach could have been more beneficial in explaining for

example why firms in a hostile environment are more likely to effectuate without the attendant improvement in performance.

- The study is cross sectional. Thus it only provides insight at that specific moment in time. As we have argued in chapter 5, only a longitudinal investigation might be able to make definitive findings on the performance implications of effectuation.
- Memory bias of managers may have negatively affected the responses. Managers were asked to answer questions related to their firm's performance over a five year period. Thus the responses were partly based on the accurate recollection of managers.
- Cognitive biases might have also been shaped by current performance and the economic context.
- The study was only conducted amongst South African firms. South Africa is relatively isolated from the developed markets of the West and the fast developing countries in Asia. Thus these results might not be generalizable.
- Judgement sampling was used since we sought the opinion of senior executives who are difficult to locate. Random sampling might generate more robust results.
- The study sample (N=94) was relatively small. This is ameliorated by the fact that as discussed in Chapter 5, 98% of the respondents were senior, board level executives which enhances the validity of the study.
- The list of proposed measures of performance might not cover all performance dimensions. We have made our conclusions solely with respect to the performance dimensions addressed.

- We adopted creation theory and the RBV of the firm as the theoretical frameworks guiding this study. However, other theoretical frameworks might play a role in the choice of strategy to pursue, predictive or non-predictive.
- Further, only surviving firms were included in the sampling frame. This introduced survivor bias and thus might limit our understanding of the optimal strategic choices.
- Finally, the causation construct was not investigated. A comparison between firms who use casual strategies with those who use effectual strategies might enlighten us on which strategic choice is optimal in a hostile environment.

6.7 Suggestions for future research

As discussed in chapter 2, empirical effectuation literature is still in its infancy, thus there is a broad range of topics scholars could explore. We shall limit our recommendation only to those that are closely related to this thesis.

Studies could examine whether effectuation moderates the EO-failure relation. Further, other environmental contexts could be investigated, e.g. environmental dynamism. Organisational configuration scholars could also enlighten us on which organisational contexts support effectuation. In addition, as we have argued in chapter 5, a longitudinal study would help explicate the real performance implications of effectuation especially if, as Rauch et al. (2009) suggest innovation is an important antecedent to performance. Likewise, effectuation encourages social action and scholars could investigate whether effectuation improves the performance of social ventures. Lastly, we have empirically shown that environmental hostility is positively related to effectuation. However, we

could not find a moderating relationship between environmental hostility and the effectuation-performance relation. Scholars could investigate the moderation relation against other outcome variables, such as failure.

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Appendix A- letter to respondents

Dear respondent,

I am completing a Masters in Management (ENVC) at The University of Witwatersrand, Johannesburg (Wits). My thesis is on the impact of strategy pursued on performance in high technology companies. Towards gathering data on this subject, I would be grateful if you could take your time to complete this questionnaire. It should not take longer than 15 minutes. I understand you are extremely busy your agreement to contribute to my research is greatly appreciated.

The questionnaire does not involve questions on your strategic plans for the future, focussing more on the general manner in which strategy is formed in the company. Your answers will be treated confidentially by Wits and the final report will be for academic purposes only.

Thank you for your kind assistance.

Appendix B- Questionnaire

Appendix C- Results

Moderation results

Table 48: Hostility as a moderator of the effectuation-innovative performance relation

LEVEL 1	Base model		Including moderator	
Innovative Performance	**B**	**p**	**B**	**p**
Intercept	1.94546	0.01		
Effectuation	0.37181	0	0.5272	0.162276
Hostility	0.02503	0.81	0.25602	0.639163
Effectuation*Hostility			-0.30995	0.666485
R^2 base	0.14319		0.1451	0.004135
ΔR^2	0.0019			
F(2,85) base	7.10276			
F(3,84) with moderator	4.75224			

Table 49: Hostility as a moderator of the experimentation-innovative performance relation

LEVEL 1	Base model		Including moderator	
Innovative Performance	**B**	**p**	**B**	**p**
Intercept	2.86022	0		
Experimentation	0.38429	0	0.28463	0.038213
Hostility	0.05299	0.6	-0.18242	0.441091
Exp*Hostility			0.29077	0.272471
R^2 base	0.15667	0	0.16875	0.00136
ΔR^2	0.01208			
F(2,85) base	7.89554			
F(3,84) with moderator	5.68407			

Table 50: Hostility as a moderator of the flexibility-innovative performance relation

LEVEL 1	Base model		Including moderator	
Innovative Performance	**B**	**p**	**B**	**p**
Intercept	2.16318	0		
Flexibility	0.41869	0	0.64069	0.036256
Hostility	0.0213	0.83	0.31015	0.419883
Flex*Hostility			-0.40771	0.436066
R^2 base	0.17959	0	0.18553	0.000602
ΔR^2	0.00594			
F(2,85) base	9.30336			
F(3,84) with moderator	6.37812			

Table 51: Effectuation as a moderator of the EO-innovative performance relation

LEVEL 1	Base model		Including moderator	
Innovative Performance	**B**	**p**	**B**	**p**
Intercept	1.08268	0.09		
EO	0.4926	0	1.18481	0.00067
Effectuation	0.15194	0.13	1.80701	0.000046
EO*Effectuation			-2.03315	0.001893
R^2 base	0.33566	0	0.40657	0
ΔR^2	0.0709			
F(2,87) base	21.9788			
F(3,86) with moderator	19.6397			

Table 52: Experimentation as a moderator of the EO-innovative performance relation

LEVEL 1	Base model		Including moderator	
Innovative Performance	**B**	**p**	**B**	**p**
Intercept	1.67014	0		
EO	0.51128	0	1.14315	0.000135
Experimentation	0.09058	0.4	0.86745	0.013385
EO*Exp			-1.26935	0.019716
R^2 base	0.32309	0	0.36479	0
ΔR^2	0.0417			
F(2,87) base	20.7621			
F(3,86) with moderator	16.4626			

Table 53: Affordable loss as a moderator of the EO-innovative performance relation

LEVEL 1	Base model		Including moderator	
Innovative Performance	**B**	**p**	**B**	**p**
Intercept	1.5935	0.01		
EO	0.56296	0.81	1.42831	0.000023
Affordable loss	0.03994	0	1.08426	0.005443
EO*AffLoss			-1.38729	0.00599
R^2 base	0.31921	0	0.37677	0
ΔR^2	0.05756			
F(2,87) base	20.3963			
F(3,86) with moderator	17.3302			

Table 54: Flexibility as a moderator of the EO-innovative performance relation

LEVEL 1	Base model		Including moderator	
Innovative Performance	**B**	**p**	**B**	**p**
Intercept	0.97751	0.08		
EO	0.46839	0	1.18659	0.000245
Flexibility	0.23259	0.02	0.92254	0.002726
EO*Flex			-1.19923	0.017444
R^2 base	0.36266	0	0.40342	0
ΔR^2	0.040761			
F(2,87) base	24.7519			
F(3,86) with moderator	19.3847			

Table 55: Pre-commitments as a moderator of the EO-innovative performance relation

LEVEL 1	Base model		Including moderator	
Innovative Performance	**B**	**p**	**B**	**p**
Intercept	1.85918	0		
EO	0.56829	0	0.29307	0.426668
Pre-commitments	-0.02685	0.77	-0.34811	0.414873
EO*Pre-commit			0.46339	0.441216
R^2 base	0.31831	0	0.32303	0
ΔR^2	0.004712			
F(2,87) base	24.7519			
F(3,86) with moderator	13.6786			

Figure 19: Scatterplot of Effectuation against EO

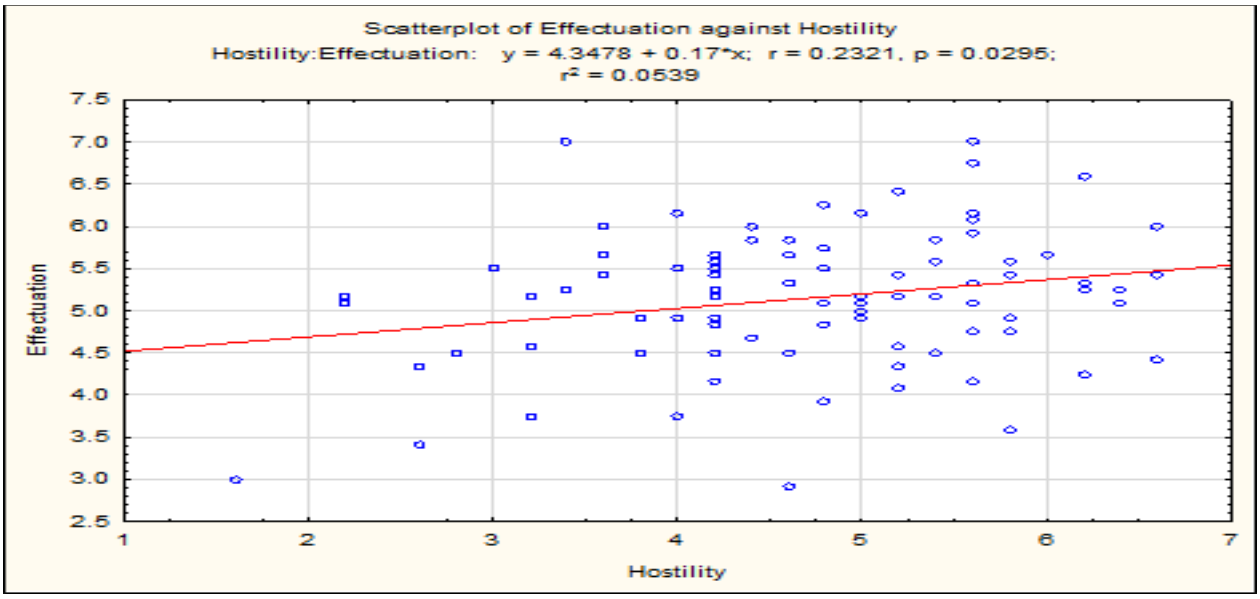

Figure 20: Scatterplot of Effectuation against Hostility

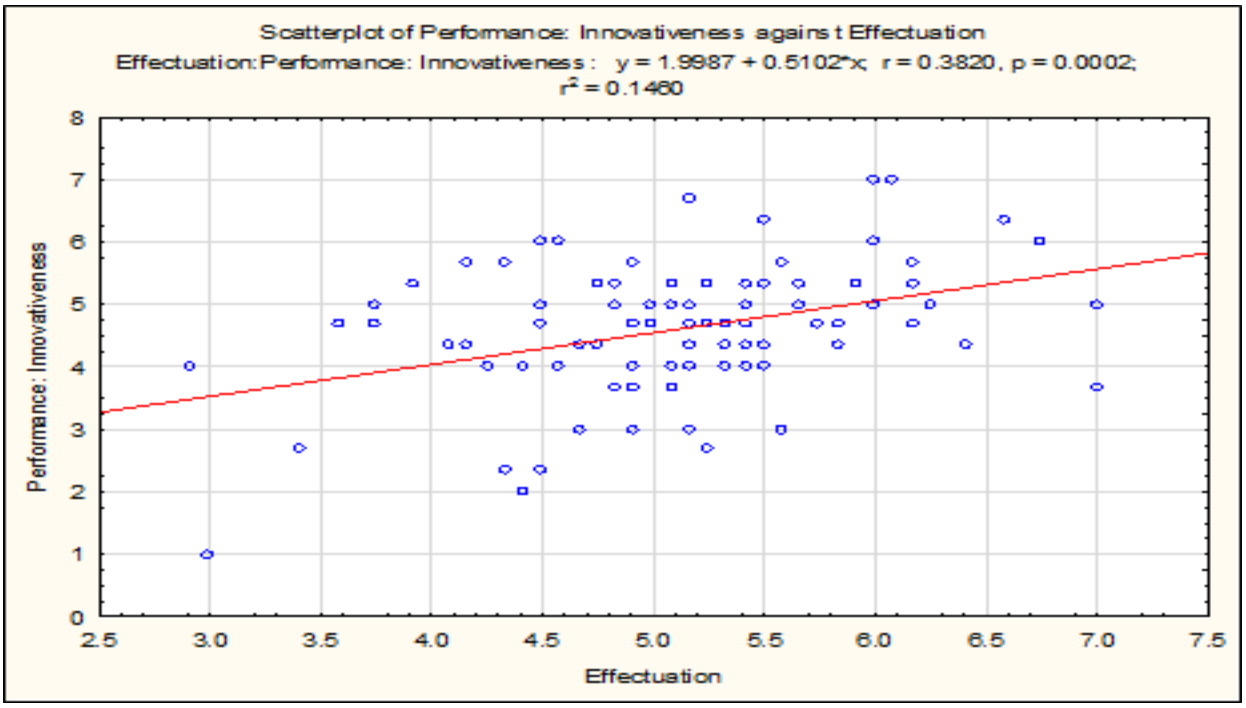

Figure 21: Scatterplot of Innovative performance against Effectuation

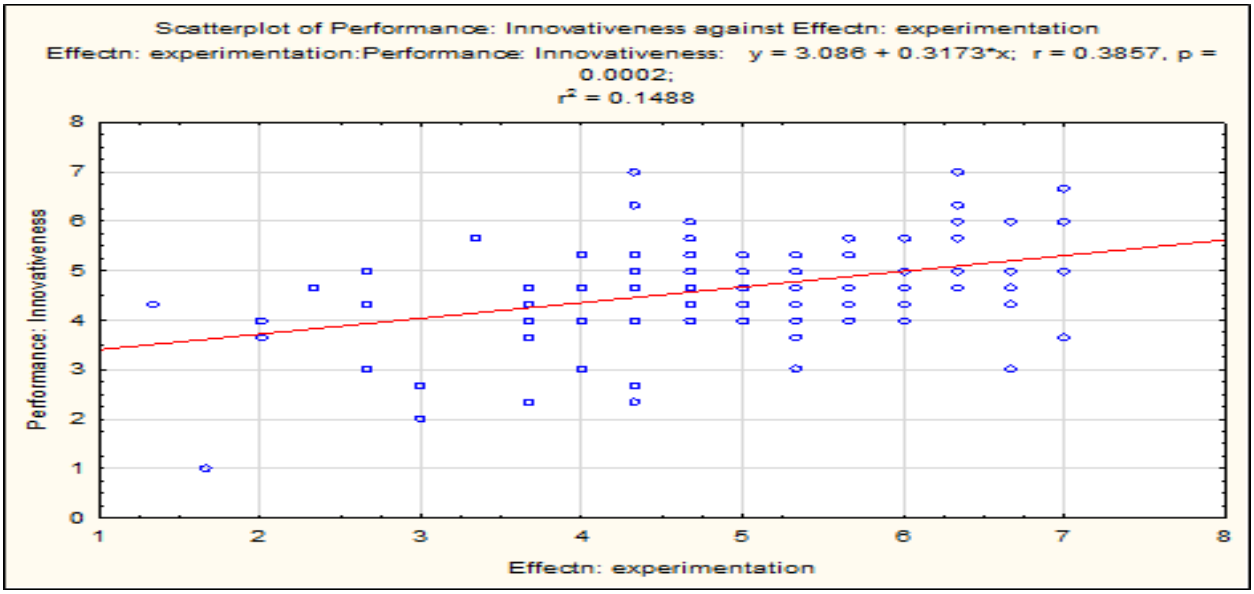

Figure 22: Scatterplot of Innovative performance against experimentation

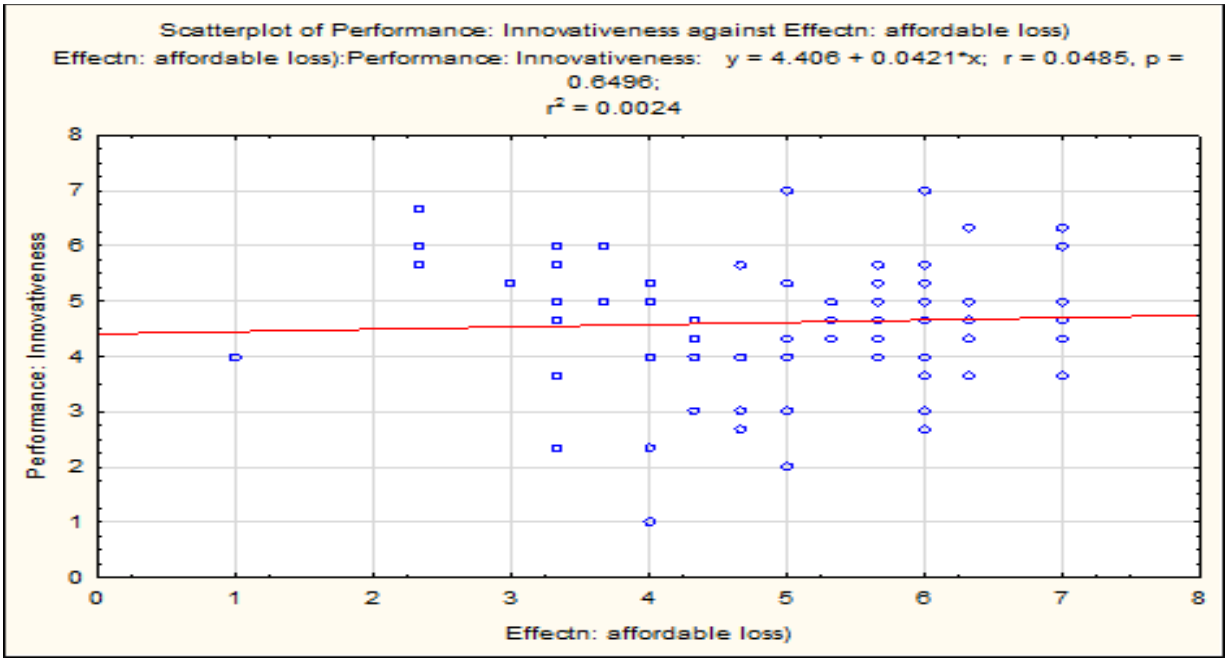

Figure 23: Scatterplot of Innovative performance against Affordable loss

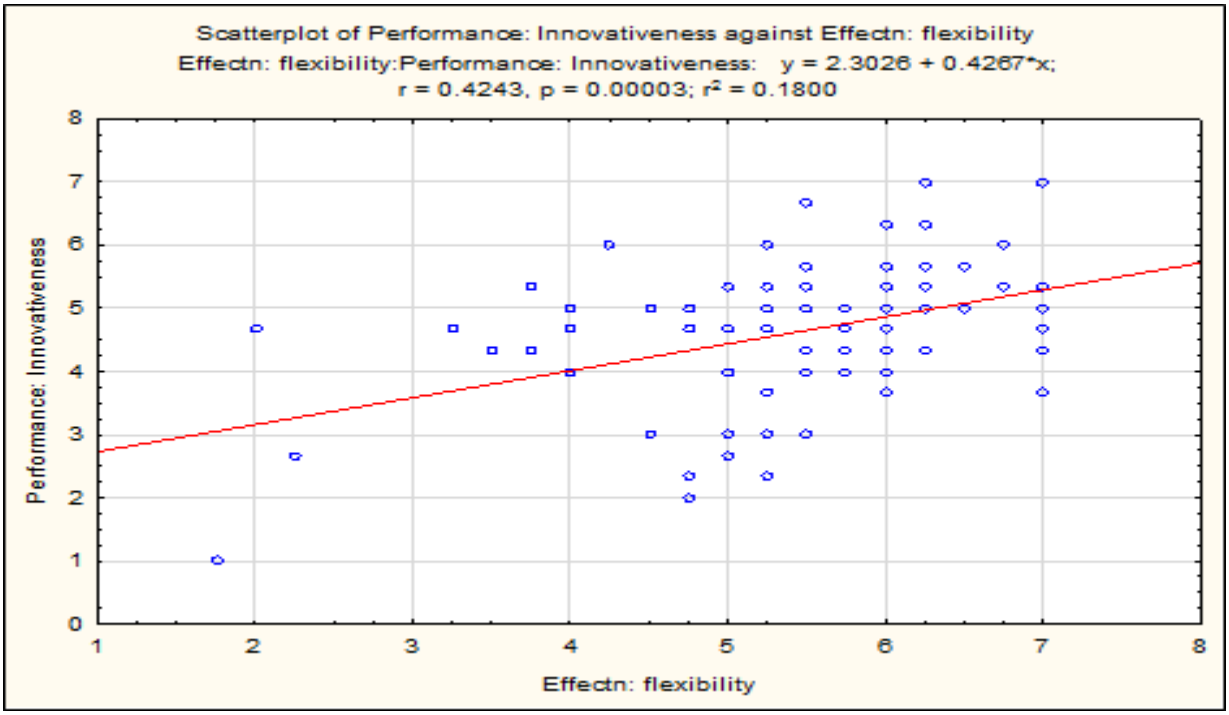

Figure 24: Scatterplot of Innovative performance against Flexibility

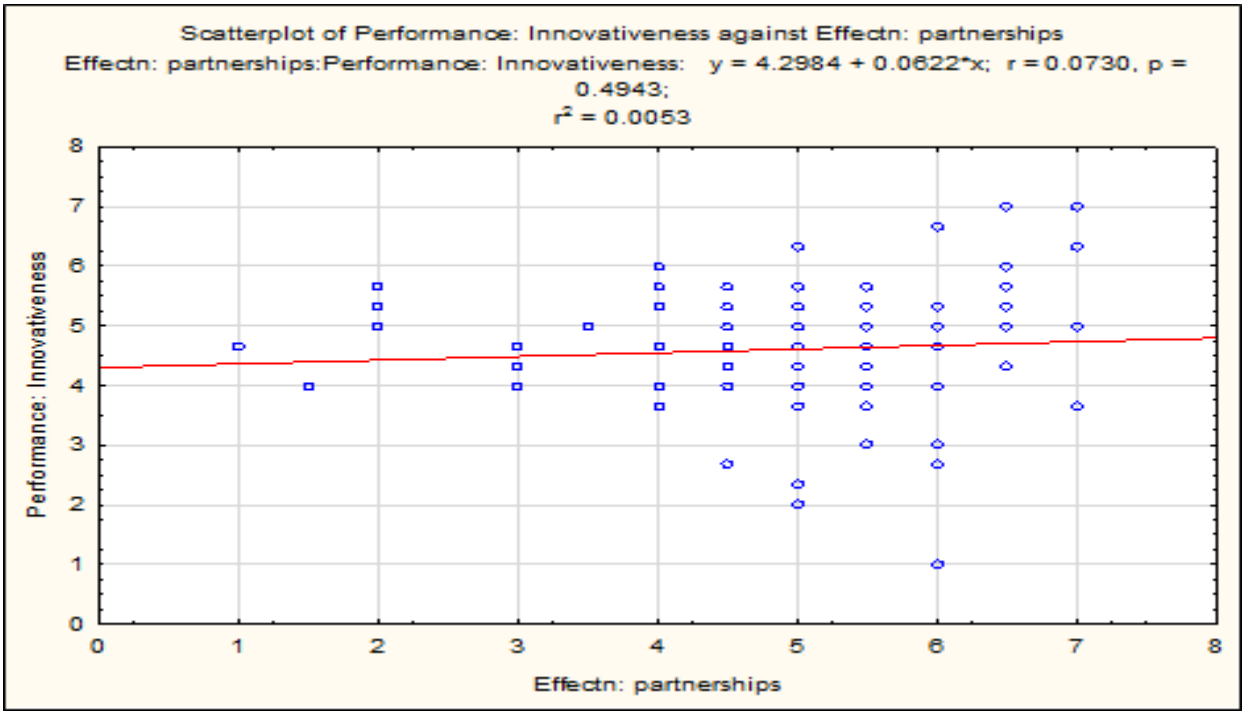

Figure 25: Scatterplot of Innovative performance against Pre-commitments/Partnerships

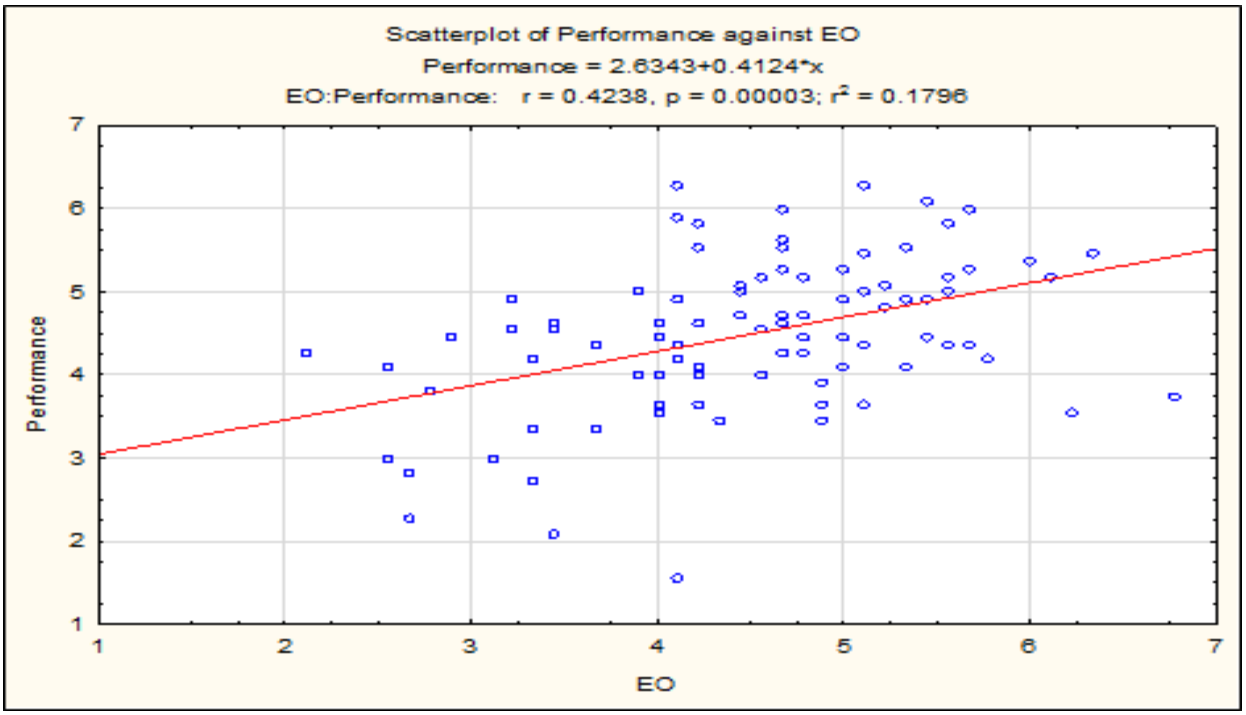

Figure 26: Scatterplot of Performance against EO

Regression Results

Table 56: Regression results: IV EO and DV Effectuation

Univariate Tests of Significance, Effect Sizes, and Powers for Effectuation

	SS	Degr. of - Freedom	MS	F	p	Partial eta-squared	Non-centrality	Observed power (alpha=0.05)		
Intercept	42.76329	1	42.76329	86.94965	0	0.485889	86.94965	1		
EO	12.31411	1	12.31411	25.038	0.000003	0.213931	25.038	0.99861		
Error	45.24714	92	0.49182							

Parameter Estimates

	Effectuation - Param.	Effectuation - Std.Err	Effectuation - t	Effectuation - p	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	Effectuation - Beta (ß)	Effectuation - St.Err.ß	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt
Intercept	3.354554	0.35975	9.32468	0	2.640059	4.069048				
EO	0.390319	0.078004	5.003798	0.000003	0.235395	0.545242	0.462526	0.092435	0.278942	0.64611

Test of SS Whole Model vs. SS Residual (Data all2 corrected)

	Multiple - R	Multiple - R^2	Adjusted - R^2	SS - Model	df - Model	MS - Model	SS - Residual	df - Residual	MS - Residual	F
Effectuation	0.462526	0.213931	0.205386	12.31411	1	12.31411	45.24714	92	0.491817	25.038

Table 57: Regression results: IV Environmental Hostility and DV Effectuation

Univariate Tests of Significance, Effect Sizes, and Powers for Effectuation

	SS	Degr. of - Freedom	MS	F	p	Partial eta-squared	Non-centrality	Observed power (alpha=0.05)		
Intercept	84.08337	1	84.08337	137.0437	0	0.614425	137.0437	1		
Hostility	3.00468	1	3.00468	4.8972	0.029549	0.053876	4.8972	0.590286		
Error	52.76544	86	0.61355							

Parameter Estimates

	Effectuation - Param.	Effectuation - Std.Err	Effectuation - t	Effectuation - p	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	Effectuation - Beta (ß)	Effectuation - St.Err.ß	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt
Intercept	4.347821	0.3714	11.70656	0	3.609502	5.086141				
Hostility	0.169983	0.076813	2.21296	0.029549	0.017285	0.322682	0.232112	0.104888	0.023602	0.440622

Test of SS Whole Model vs. SS Residual

	Multiple - R	Multiple - R^2	Adjusted - R^2	SS - Model	df - Model	MS - Model	SS - Residual	df - Residual	MS - Residual	F
Effectuation	0.232112	0.053876	0.042875	3.004679	1	3.004679	52.76544	86	0.613552	4.89719

Table 58: Regression results: IV effectuation and DV Innovative performance

Univariate Tests of Significance, Effect Sizes, and Powers for Performance: Innovativeness

	SS	Degr. of - Freedom	MS	F	p	Partial eta-squared	Non-centrality	Observed power (alpha=0.05)		
Intercept	8.3633	1	8.3633	8.54983	0.004393	0.088554	8.54983	0.82433		
Effectuation	14.71117	1	14.71117	15.03927	0.000203	0.145957	15.03927	0.969633		
Error	86.08019	88	0.97818							

Parameter Estimates

	Performance: Innovativeness - Param.	Performance: Innovativeness - Std.Err	Performance: Innovativeness - t	Performance: Innovativeness - p	-95.00% - Cnf.Lmt	+95.00 % - Cnf.Lmt	Performance: Innovativeness - Beta (ß)	Performance: Innovativeness - St.Err.ß	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt
Intercept	1.998699	0.683548	2.924009	0.004393	0.640292	3.357107				
Effectuation	0.51017	0.131553	3.878049	0.000203	0.248736	0.771605	0.382043	0.098514	0.186267	0.577819

Test of SS Whole Model vs. SS Residual

	Multiple - R	Multiple - R^2	Adjusted - R^2	SS - Model	df - Model	MS - Model	SS - Residual	df - Residual	MS - Residual	F	p
Performance: Innovativeness	0.382043	0.145957	0.136252	14.71117	1	14.71117	86.08019	88	0.978184	15.03927	0.000203

Table 59: Regression results: IV Experimentation and DV Innovative performance

Univariate Tests of Significance, Effect Sizes, and Powers for Performance: Innovativeness

	SS	Degr. of - Freedom	MS	F	p	Partial eta-squared	Non-centrality	Observed power (alpha=0.05)			
Intercept	56.78306	1	56.78306	58.24273	0	0.398261	58.24273	1			
Experiment-ation	14.9968	1	14.9968	15.3823	0.000174	0.14879	15.3823	0.972502			
Error	85.79456	88	0.97494								
Parameter Estimate											
	Performance : Innovativeness - Param.	Performance : Innovativeness - Std.Err	Performance : Innovativeness - t	Performance : Innovativeness - p	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	Performance : Innovativeness - Beta (ß)	Performance : Innovativeness - St.Err.ß	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	
Intercept	3.086011	0.404368	7.631693	0	2.282415	3.889607					
Experimentation	0.317314	0.080906	3.922028	0.000174	0.156531	0.478096	0.385734	0.098351	0.190283	0.581185	
Test of SS Whole Model vs. SS Residual											
	Multiple - R	Multiple - R^2	Adjusted - R^2	SS - Model	df - Model	MS - Model	SS - Residual	df - Residual	MS - Residual	F	p
Performance: Innovativeness	0.385734	0.14879	0.139118	14.9968	1	14.9968	85.79456	88	0.974938	15.3823	0.000174

Table 60: Regression results: IV EO and DV Experimentation

Parameter Estimates

	Experimentation - Param.	Experimentation - Std.Err	Experimentation - t	Experimentation - p	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	Experimentation - Beta (ß)	Experimentation - St.Err.ß	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt
Intercept	1.322924	0.54265	2.437895	0.016695	0.245174	2.400675				
EO	0.781739	0.117663	6.643898	0	0.548051	1.015427	0.569414	0.085705	0.399197	0.739631

Test of SS Whole Model vs. SS Residual

	Multiple - R	Multiple - R^2	Adjusted - R^2	SS - Model	df - Model	MS - Model	SS - Residual	df - Residual	MS - Residual	F	p
Experimentation	0.569414	0.324232	0.316887	49.39555	1	49.39555	102.9508	92	1.11903	44.14139	0

Table 61: Regression results: IV Flexibility and DV Innovative performance

Univariate Tests of Significance, Effect Sizes, and Powers for Performance: Financial

	SS	Degr. of - Freedom	MS	F	p	Partial eta-squared	Non-centrality	Observed power (alpha=0.05)
Intercept	26.6276	1	26.62759	17.52411	0.000067	0.166067	17.52411	0.985376
Flexibility	6.6077	1	6.60769	4.34864	0.039935	0.047089	4.34864	0.540883
Error	133.7145	88	1.51948					

Parameter Estimates

	Performance: Financial - Param.	Performance: Financial - Std.Err	Performance: Financial - t	Performance: Financial - p	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	Performance: Financial - Beta (ß)	Performance: Financial - St.Err.ß	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt
Intercept	2.857913	0.682702	4.18618	0.000067	1.501187	4.21464				
Flexibility	0.257498	0.12348	2.085339	0.039935	0.012107	0.502889	0.217001	0.10406	0.010203	0.423799

Test of SS Whole Model vs. SS Residual

	Multiple - R	Multiple - R^2	Adjusted - R^2	SS - Model	df - Model	MS - Model	SS - Residual	df - Residual	MS - Residual	F	p
Performance: Financial	0.217001	0.047089	0.036261	6.607686	1	6.607686	133.7145	88	1.519483	4.34864	0.039935

Table 62: Regression results: IVs Effectuation and EO, and DV Innovative performance

Parameter Estimates

	Performance : Innovativeness - Param.	Performance : Innovativeness - Std.Err	Performance : Innovativeness - t	Performance : Innovativeness - p	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	Performance : Innovativeness - Beta (ß)	Performance : Innovativeness - St.Err.ß	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	
Intercept	1.765278	0.455458	3.875829	0.000204	0.860153	2.670405					
EO	0.632319	0.098801	6.399946	0	0.435973	0.828664	0.563573	0.088059	0.388574	0.738571	

Test of SS Whole Model vs. SS Residual

	Multiple - R	Multiple - R^2	Adjusted - R^2	SS - Model	df - Model	MS - Model	SS - Residual	df - Residual	MS - Residual	F	p
Performance: Innovativeness	0.563573	0.317614	0.30986	32.01277	1	32.01277	68.77859	88	0.781575	40.95931	0

Parameter Estimates

	Performance : Innovativeness - Param.	Performance : Innovativeness - Std.Err	Performance : Innovativeness - t	Performance : Innovativeness - p	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	Performance : Innovativeness - Beta (ß)	Performance : Innovativeness - St.Err.ß	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	
Intercept	1.998699	0.683548	2.924009	0.004393	0.640292	3.357107					
Effectuation	0.51017	0.131553	3.878049	0.000203	0.248736	0.771605	0.382043	0.098514	0.186267	0.577819	

Test of SS Whole Model vs. SS Residual

	Multiple - R	Multiple - R^2	Adjusted - R^2	SS - Model	df - Model	MS - Model	SS - Residual	df - Residual	MS - Residual	F	p
Performance: Innovativeness	0.382043	0.145957	0.136252	14.71117	1	14.71117	86.08019	88	0.978184	15.03927	0.000203

Table 63: Regression results: IV experimentation and DV Innovative performance

Parameter Estimates

	Performance: Innovativeness - Param.	Performance: Innovativeness - Std.Err	Performance: Innovativeness - t	Performance: Innovativeness - p	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	Performance: Innovativeness - Beta (ß)	Performance: Innovativeness - St.Err.ß	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	
Intercept	3.086011	0.404368	7.631693	0	2.282415	3.889607					
Experimentation	0.317314	0.080906	3.922028	0.000174	0.156531	0.478096	0.385734	0.098351	0.190283	0.581185	
Test of SS Whole Model vs. SS Residual											
	Multiple - R	Multiple - R^2	Adjusted - R^2	SS - Model	df - Model	MS - Model	SS - Residual	df - Residual	MS - Residual	F	p
Performance: Innovativeness	0.385734	0.14879	0.139118	14.9968	1	14.9968	85.79456	88	0.974938	15.3823	0.000174

Table 64: Regression results: IV Affordable loss and DV Innovative performance

Parameter Estimates

	Performance: Innovativeness - Param.	Performance: Innovativeness - Std.Err	Performance: Innovativeness - t	Performance: Innovativeness - p	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	Performance: Innovativeness - Beta (ß)	Performance: Innovativeness - St.Err.ß	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	
Intercept	4.40603	0.479556	9.187733	0	3.453014	5.359046					
Affordable loss	0.042123	0.092405	0.455857	0.649616	-0.14151	0.225758	0.048537	0.106475	-0.16306	0.260133	
Test of SS Whole Model vs. SS Residual											
	Multiple - R	Multiple - R^2	Adjusted - R^2	SS - Model	df - Model	MS - Model	SS - Residual	df - Residual	MS - Residual	F	p
Performance: Innovativeness	0.048537	0.002356	-0.00898	0.237451	1	0.237451	100.5539	88	1.142658	0.207806	0.649616

Table 65: Regression results: IV Flexibility and DV Innovative performance

Parameter Estimates

	Performance: Innovativeness - Param.	Performance: Innovativeness - Std.Err	Performance: Innovativeness - t	Performance: Innovativeness - p	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	Performance: Innovativeness - Beta (ß)	Performance: Innovativeness - St.Err.ß	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	
Intercept	2.30263	0.536736	4.290061	0.000046	1.23598	3.36928					
Flexibility	0.426673	0.097079	4.395099	0.000031	0.233749	0.619598	0.424262	0.096531	0.232428	0.616097	
Test of SS Whole Model vs. SS Residual (Data all2 corrected)											
	Multiple - R	Multiple - R^2	Adjusted - R^2	SS - Model	df - Model	MS - Model	SS - Residual	df - Residual	MS - Residual	F	p
Performance: Innovativeness	0.424262	0.179999	0.17068	18.14231	1	18.14231	82.64905	88	0.939194	19.3169	0.000031

Table 66: Regression results: IV Pre-commitments and DV Innovative performance

Parameter Estimates

	Performance: Innovativeness - Param.	Performance: Innovativeness - Std.Err	Performance: Innovativeness - t	Performance: Innovativeness - p	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	Performance: Innovativeness - Beta (ß)	Performance: Innovativeness - St.Err.ß	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	
Intercept	4.2984	0.479752	8.959635	0	3.344994	5.251805					
Pre-commitments	0.062226	0.090656	0.686402	0.494264	-0.11793	0.242385	0.072976	0.106316	-0.13831	0.284257	
Test of SS Whole Model vs. SS Residual											
	Multiple - R	Multiple - R^2	Adjusted - R^2	SS - Model	df - Model	MS - Model	SS - Residual	df - Residual	MS - Residual	F	p
Performance: Innovativeness	0.072976	0.005325	-0.00598	0.536758	1	0.536758	100.2546	88	1.139257	0.471148	0.494264

Table 67: Regression results: IV EO and DV Performance

Univariate Tests of Significance, Effect Sizes, and Powers for Performance

	SS	Degr. of - Freedom	MS	F	p	Partial eta-squared	Non-centrality	Observed power (alpha=0.05)
Intercept	26.14531	1	26.14531	37.00632	0	0.296036	37.00632	0.999975
EO	13.61414	1	13.61414	19.26959	0.000031	0.179637	19.26959	0.991376
Error	62.17282	88	0.70651					

Parameter Estimates

	Performance - Param.	Performance - Std.Err	Performance - t	Performance - p	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt	Performance - Beta (ß)	Performance - St.Err.ß	-95.00% - Cnf.Lmt	+95.00% - Cnf.Lmt
Intercept	2.634268	0.433034	6.083282	0	1.773704	3.494832				
EO	0.412353	0.093936	4.389714	0.000031	0.225675	0.599032	0.423836	0.096552	0.231959	0.615713

Test of SS Whole Model vs. SS Residual

	Multiple - R	Multiple - R^2	Adjusted - R^2	SS - Model	df - Model	MS - Model	SS - Residual	df - Residual	MS - Residual	F	p
Performance	0.423836	0.179637	0.170315	13.61414	1	13.61414	62.17282	88	0.706509	19.26959	0.000031

Descriptive Statistics

Table 68: Descriptive statistics (all data)

Descriptive Statistics

	Valid N	Mean	Confidence - -95.000%	Confidence - 95.000%	Median	Minimum	Std.Dev.	Skewness	Kurtosis
Effectuation	94.00	5.12	4.96	5.28	5.17	2.92	0.79	-0.21	0.56
EO	94.00	4.52	4.33	4.71	4.61	2.11	0.93	-0.29	-0.07
Performance	90.00	4.49	4.30	4.69	4.50	1.55	0.92	-0.55	0.69
Hostility	88.00	4.71	4.48	4.94	4.80	1.60	1.09	-0.49	-0.03
Experimentation	94.00	4.85	4.59	5.12	5.00	1.33	1.28	-0.49	0.07
Affordable loss	94.00	4.98	4.72	5.24	5.00	1.00	1.28	-0.72	0.28
Flexibility	94.00	5.41	5.19	5.62	5.50	1.75	1.04	-1.19	2.23
Pre-commitments	94.00	5.14	4.89	5.40	5.50	1.00	1.24	-1.14	1.54
Proactiveness	94.00	4.87	4.64	5.09	5.00	1.00	1.10	-0.60	0.67
Risk taking	94.00	4.41	4.17	4.66	4.33	1.00	1.20	-0.25	-0.03
Innovativeness	94.00	4.28	4.03	4.52	4.33	1.00	1.20	-0.52	-0.23
Performance: Financial	90.00	4.26	3.99	4.52	4.40	1.00	1.26	-0.47	-0.01
Performance: Market	90.00	4.77	4.55	4.99	4.67	1.00	1.04	-0.54	1.25
Performance: Innovativeness	90.00	4.62	4.40	4.84	4.67	1.00	1.06	-0.57	1.20
Hostility: Riskiness	88.00	4.42	4.12	4.72	4.50	1.00	1.43	-0.40	-0.48
Hostility: Competition	88.00	4.91	4.64	5.17	5.17	1.33	1.27	-0.42	-0.20
Q6: The product/service that my company now provides is essentially the same as originally conceptualised	94.00	3.07	2.69	3.46	2.00	1.00	1.86	0.82	-0.64
Q7: My company has experimented with different products and/or business models	94.00	5.61	5.34	5.87	6.00	2.00	1.30	-1.40	1.83
Q8: When launching a new product or service, my company tries a number of different approaches	94.00	5.10	4.77	5.42	6.00	1.00	1.57	-0.94	0.07
Q9: The product/service that my company now provides is substantially different than we first imagined	94.00	3.86	3.48	4.25	4.00	1.00	1.88	0.05	-1.40

Q10: When launching a new product/service, my company is careful to invest only the resources we can afford to lose.	94.00	4.35	3.99	4.71	5.00	1.00	1.74	-0.23	-1.30
Q11: When launching a new product/service, my company is careful not to risk more money than we are willing to loose.	94.00	4.87	4.54	5.20	5.00	1.00	1.60	-0.77	-0.32
Q12: When launching a new product/service, we are careful to invest only so much money that the company will survive	94.00	5.71	5.44	5.98	6.00	1.00	1.31	-1.68	3.02
Q13: My company allows the business to evolve as opportunities emerge.	94.00	5.80	5.55	6.05	6.00	1.00	1.21	-1.92	4.29
Q14: My company has adapted what we are doing to the resources we have	94.00	5.09	4.74	5.43	6.00	1.00	1.70	-0.80	-0.48
Q15: My company is flexible and takes advantage of opportunities as they arise.	94.00	5.69	5.45	5.93	6.00	2.00	1.15	-1.46	2.39
Q16: My company has avoided courses of action that restrict our flexibility and adaptability.	94.00	5.05	4.74	5.37	6.00	1.00	1.53	-0.96	-0.05
Q17: My company has a substantial number of agreements with customers, suppliers and other organisations.	94.00	5.14	4.82	5.46	6.00	1.00	1.55	-1.10	0.55
Q18: My company uses pre-commitments from customers and suppliers as often as possible.	94.00	5.15	4.87	5.43	5.00	1.00	1.38	-1.32	1.74
Q19: At my company, we talk with people we know to enlist their support in developing the business.	94.00	4.64	4.28	4.99	5.00	1.00	1.73	-0.86	-0.26
Q20: My company typically initiates actions that competitors respond to.	94.00	5.10	4.83	5.36	5.00	1.00	1.30	-0.97	1.22
Q21: My company is very often the first business to introduce new products/services, administrative techniques etc	94.00	4.79	4.49	5.08	5.00	1.00	1.45	-0.70	0.15
Q22: My company typically adopts a very competitive, aggressive stance against competitors	94.00	4.71	4.42	5.01	5.00	1.00	1.45	-0.33	-0.50
Q23: My company has a strong inclination for high-risk projects with chances of very high returns	94.00	3.54	3.22	3.86	3.00	1.00	1.57	0.25	-0.97
Q24: Owing to the nature of the environment, bold initiatives are necessary to achieve my company's objectives	94.00	5.03	4.74	5.33	5.00	1.00	1.44	-0.81	0.24

Q25: My company typically adopts a bold, aggressive posture in order to maximise the probability of explo	94.00	4.66	4.37	4.95	5.00	1.00	1.41	-0.64	-0.15
Q26: My company has a strong emphasis on research and development, technological leadership…	94.00	4.89	4.52	5.27	5.00	1.00	1.82	-0.69	-0.58
Q27: My company has many lines of products or services	94.00	4.73	4.39	5.08	5.00	1.00	1.69	-0.55	-0.99
Q28: At my company, there have been considerable changes in our product or service lines	94.00	3.20	2.98	3.42	3.00	1.00	1.06	-0.14	-1.06
Q29: Over the past 5 years, our financial performance has exceeded our expectations	90.00	4.06	3.68	4.43	4.00	1.00	1.78	-0.23	-1.12
Q30: Over the past 5 years, our financial performance has exceeded that of our competitors	90.00	4.48	4.18	4.77	4.00	1.00	1.40	-0.48	-0.35
Q31: Over the past 5 years, we have been more profitable than our competitors have	90.00	4.48	4.20	4.75	4.00	1.00	1.31	-0.52	0.28
Q32: Over the past 5 years, our revenue (sales) growth has exceeded our expectations	90.00	3.99	3.65	4.32	4.00	1.00	1.60	-0.20	-0.98
Q33: Over the past 5 years, our revenue growth rate has exceeded that of our competitors	90.00	4.28	4.00	4.55	4.00	1.00	1.31	-0.63	0.53
Q34: Over the past 5 years, our customer satisfaction has been outstanding	90.00	5.02	4.73	5.32	5.00	1.00	1.40	-0.87	0.56
Q35: Over the past 5 years, our customer satisfaction has exceeded that of our competitors	90.00	4.99	4.75	5.23	5.00	1.00	1.16	-0.42	0.75
Q36: Last year, our market was share much higher than that of our competitors	90.00	4.30	3.99	4.61	4.00	1.00	1.46	-0.17	-0.17
Q37: Our company is better at introducing new products and services to the market than our competitors	90.00	4.42	4.13	4.72	4.00	1.00	1.40	-0.34	-0.18
Q38: Last year, the percentage of our new products in the existing product portfolio exceeded that of our competitors	90.00	4.10	3.81	4.39	4.00	1.00	1.39	-0.16	0.05
Q39: Over the last year, we have introduced innovations for work processes and methods	90.00	5.33	5.05	5.61	6.00	1.00	1.34	-1.35	2.06

Q40: We have innovations under intellectual property protection	90.00	4.16	3.75	4.56	4.00	1.00	1.92	-0.21	-1.23
Q41: The failure rate of firms in my industry is high	88.00	4.51	4.17	4.85	5.00	1.00	1.60	-0.54	-0.40
Q42: My industry is very risky; one bad decision could threaten its viability	88.00	4.33	3.98	4.68	5.00	1.00	1.65	-0.28	-1.13
Q43: Competition in my industry is high	88.00	5.60	5.33	5.87	6.00	1.00	1.27	-1.40	2.12
Q44: Customer loyalty in my industry is low	88.00	4.14	3.78	4.50	5.00	1.00	1.70	-0.06	-1.16
Q45: Severe price wars are characteristic of my industry	88.00	4.53	4.17	4.90	5.00	1.00	1.73	-0.67	-0.57
Q46: Low profit margins are characteristic of my industry	88.00	4.58	4.19	4.97	5.00	1.00	1.83	-0.38	-1.04

Residual Analysis

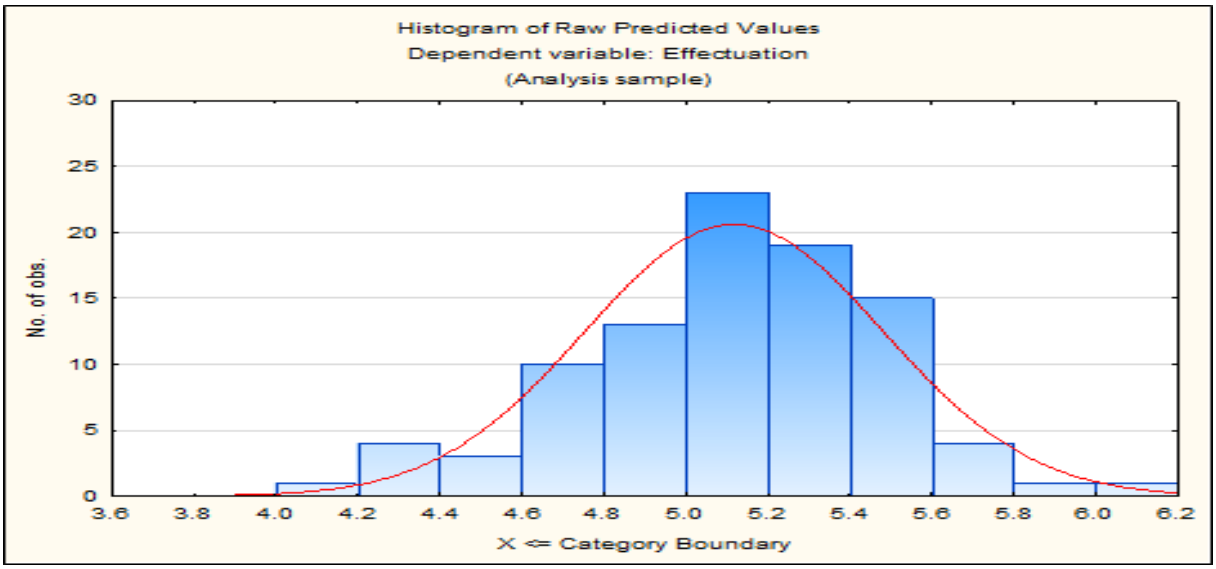

Figure 27: Histogram Residuals EO vs Effectuation

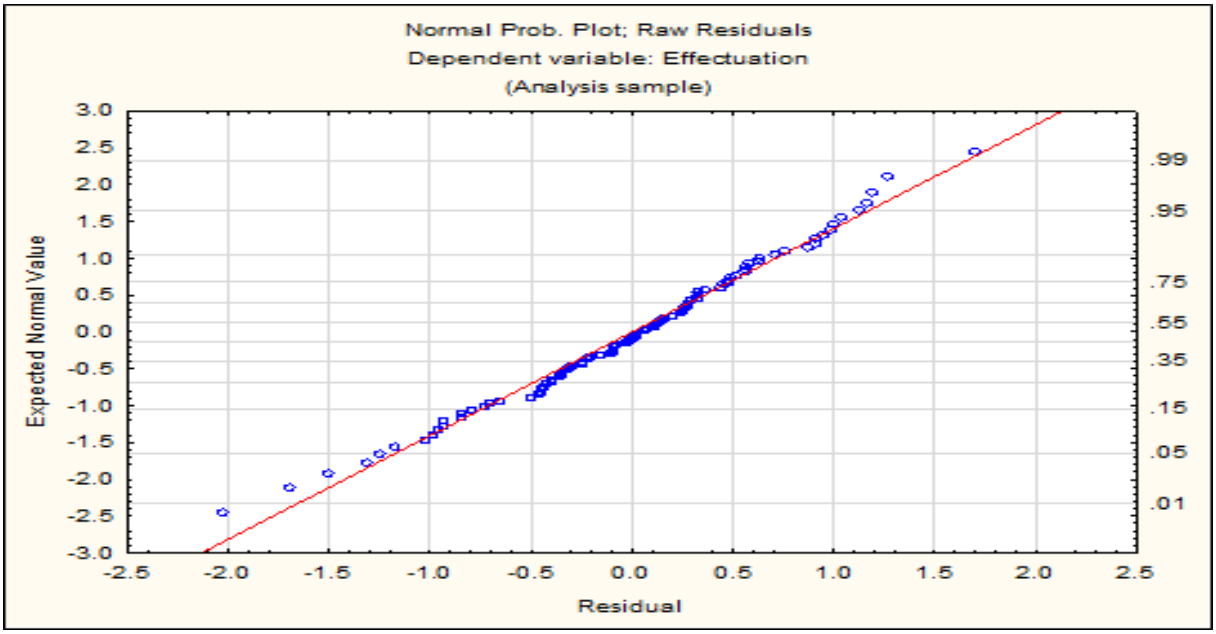

Figure 28: Normal probability plot: EO vs Effectuation

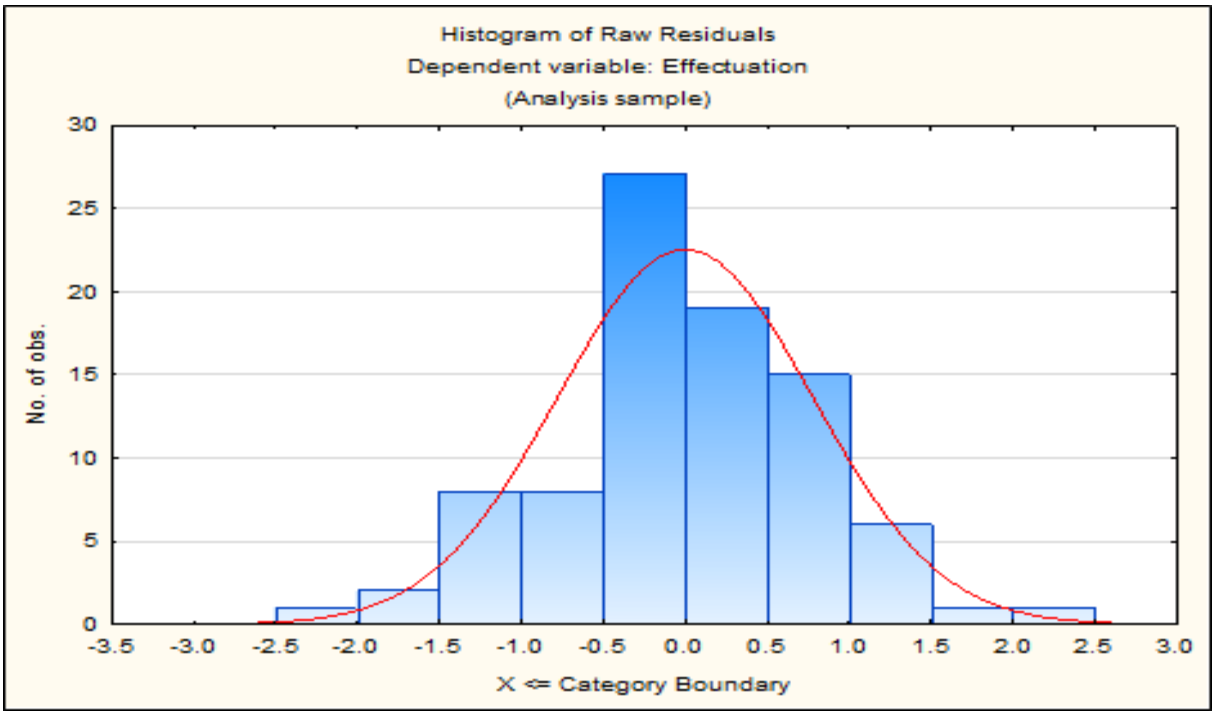

Figure 29: Histogram Residuals Environmental Hostility vs Effectuation

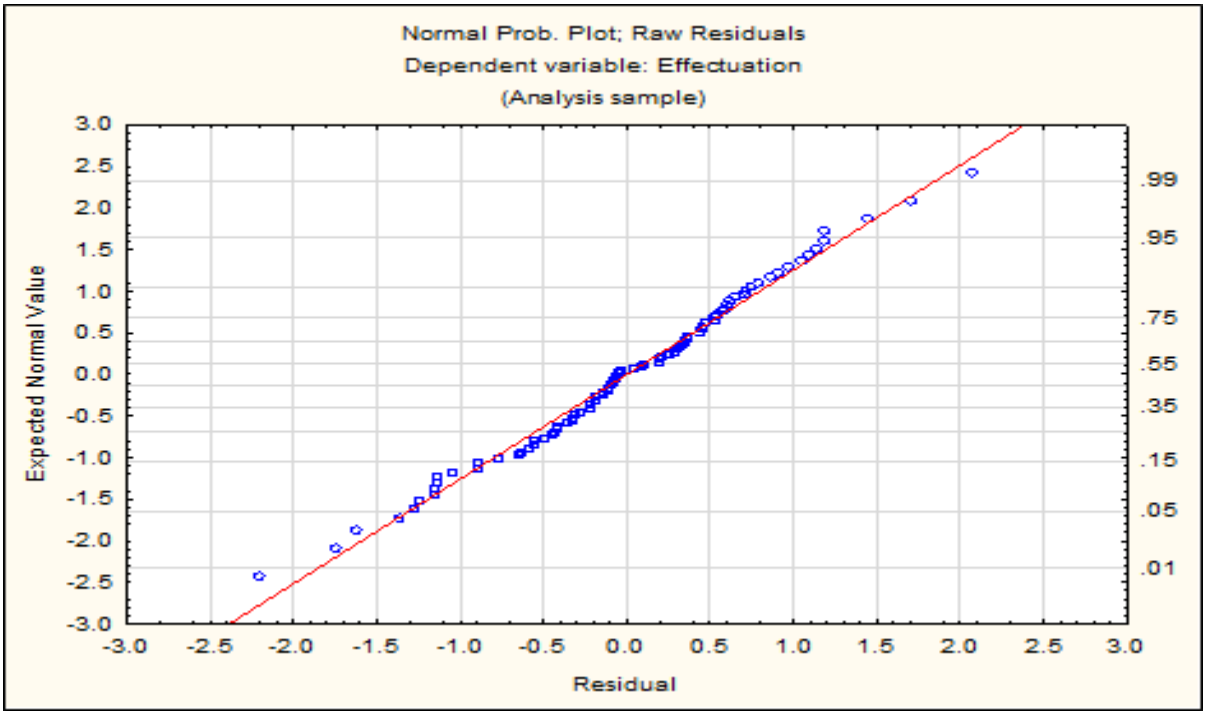

Figure 30: Normal probability plot: Environmental Hostility vs Effectuation

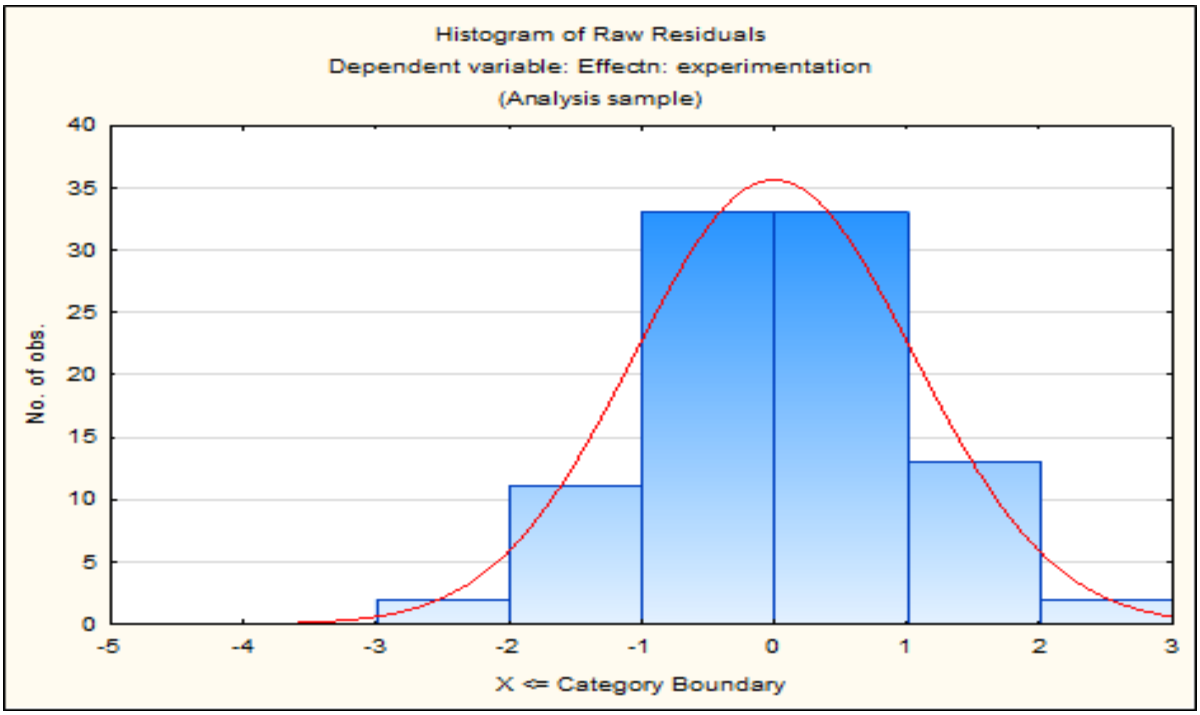

Figure 31: Histogram Residuals EO vs Experimentation

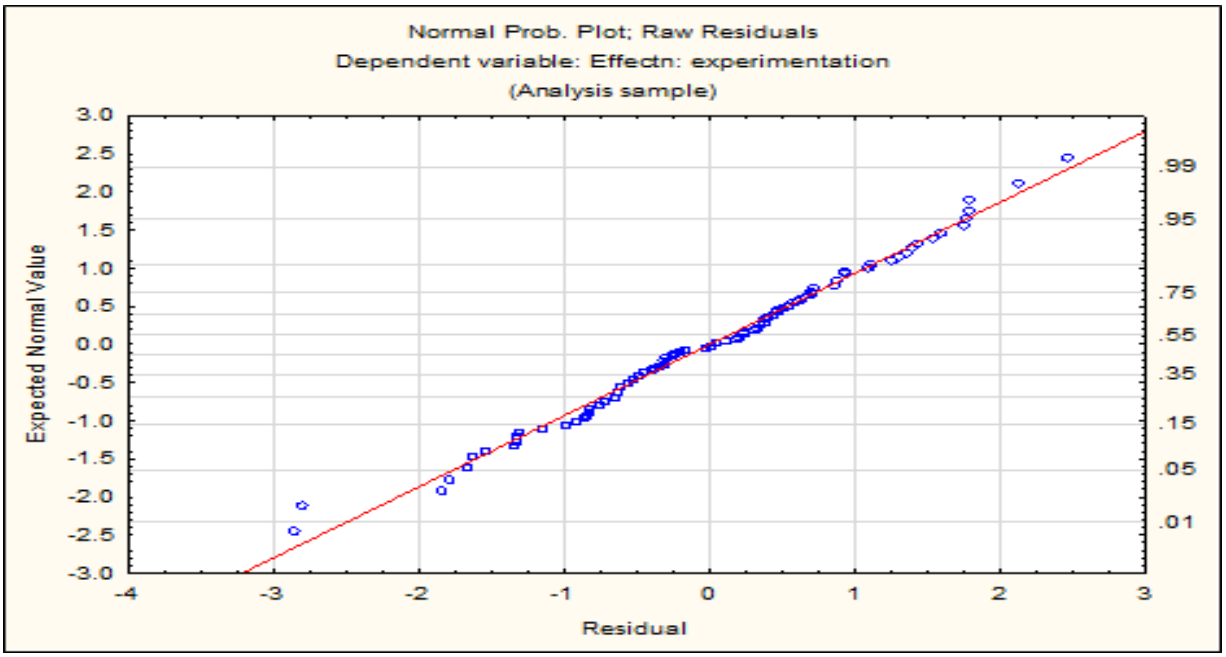

Figure 32: Normal probability plot: EO vs Experimentati

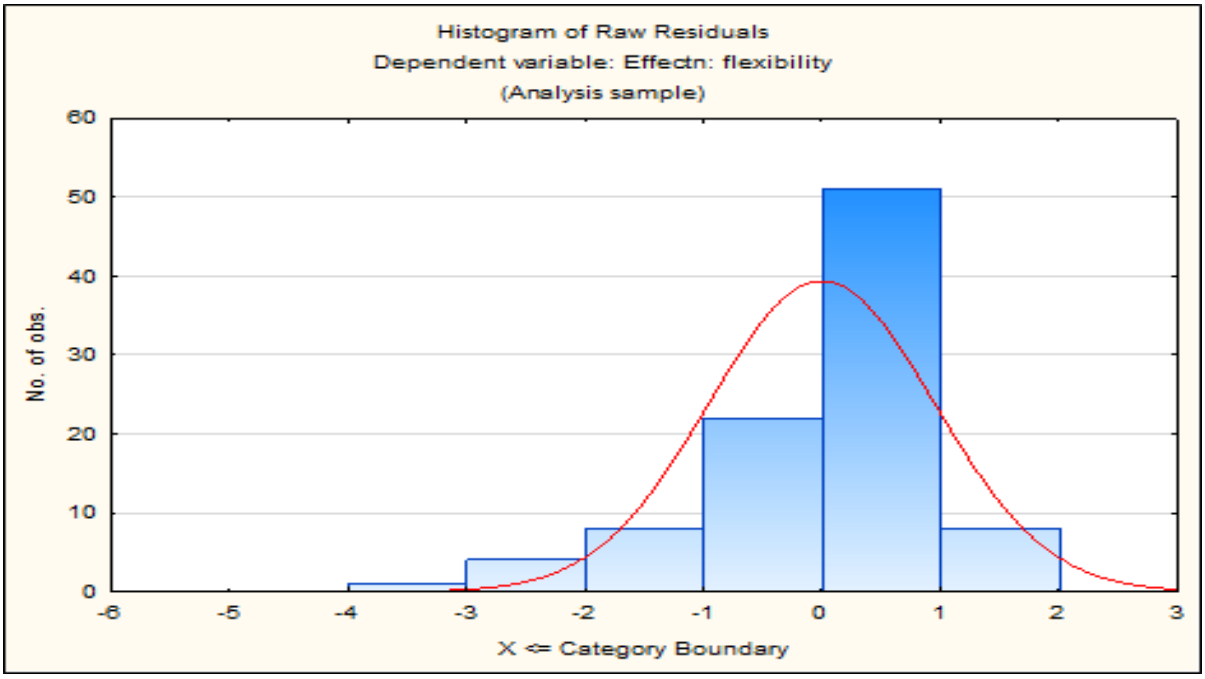

Figure 33: Histogram Residuals EO vs Flexibility

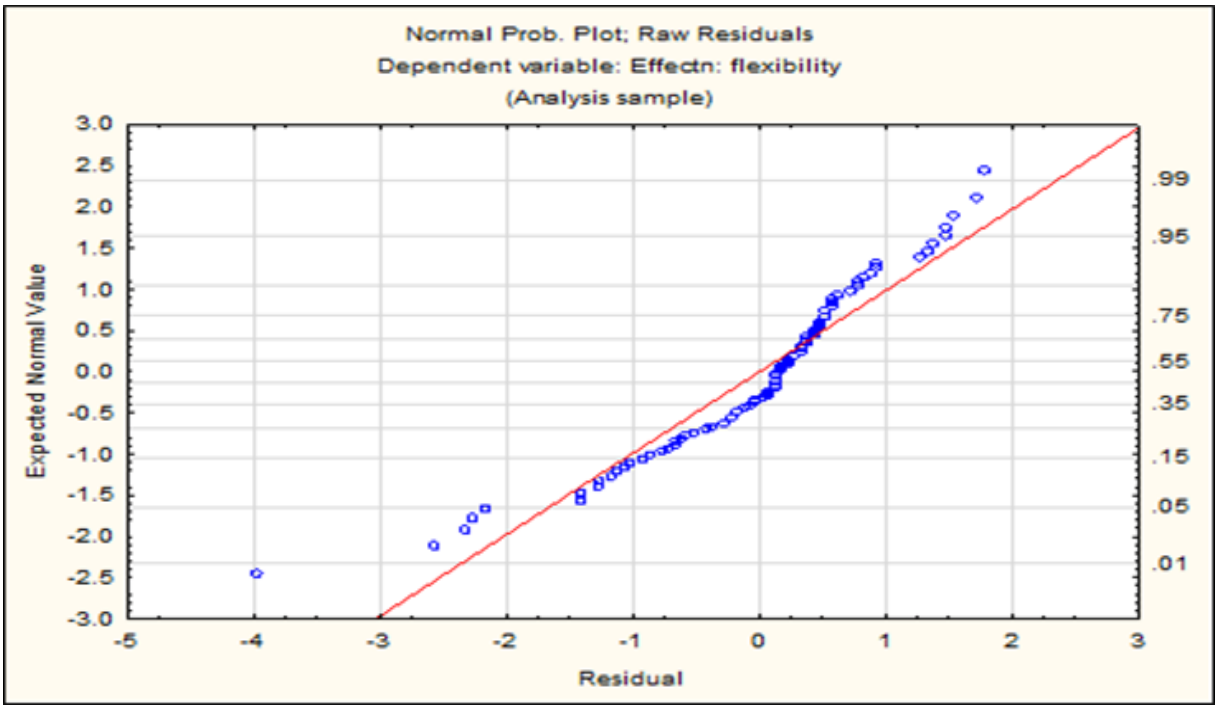

Figure 34: Normal probability plot: EO vs Flexibility

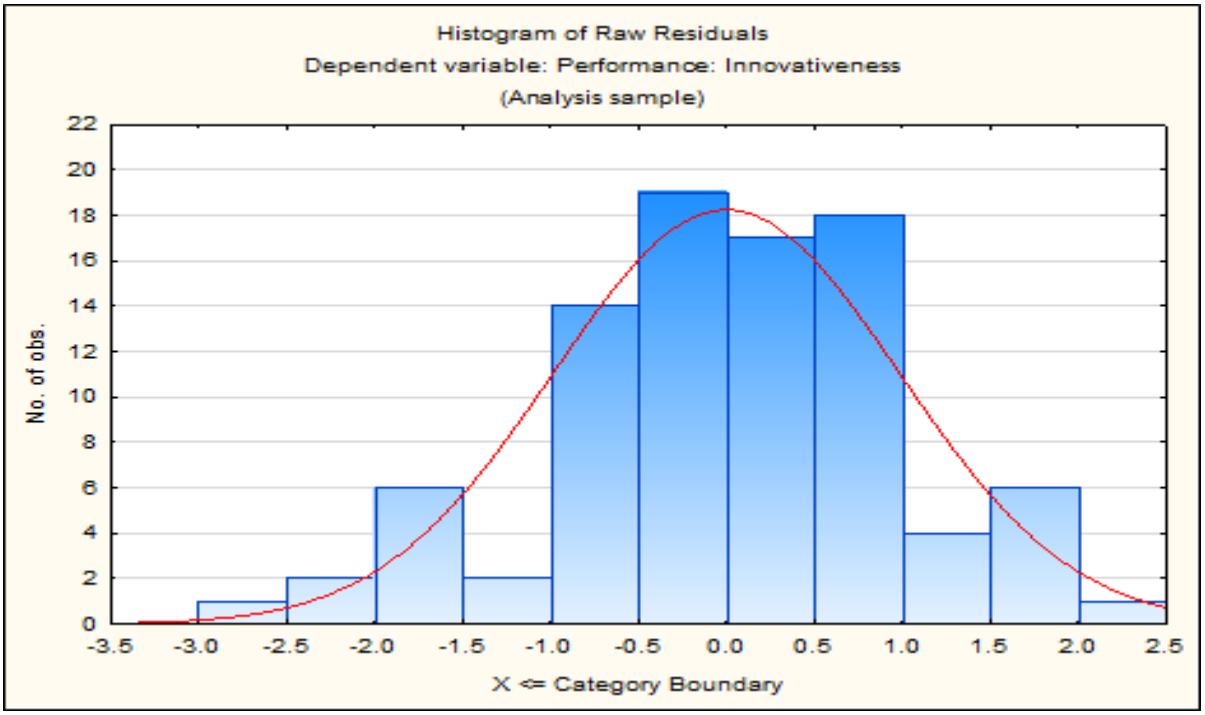

Figure 35: Normal probability plot: Effectuation vs Innovative Performance

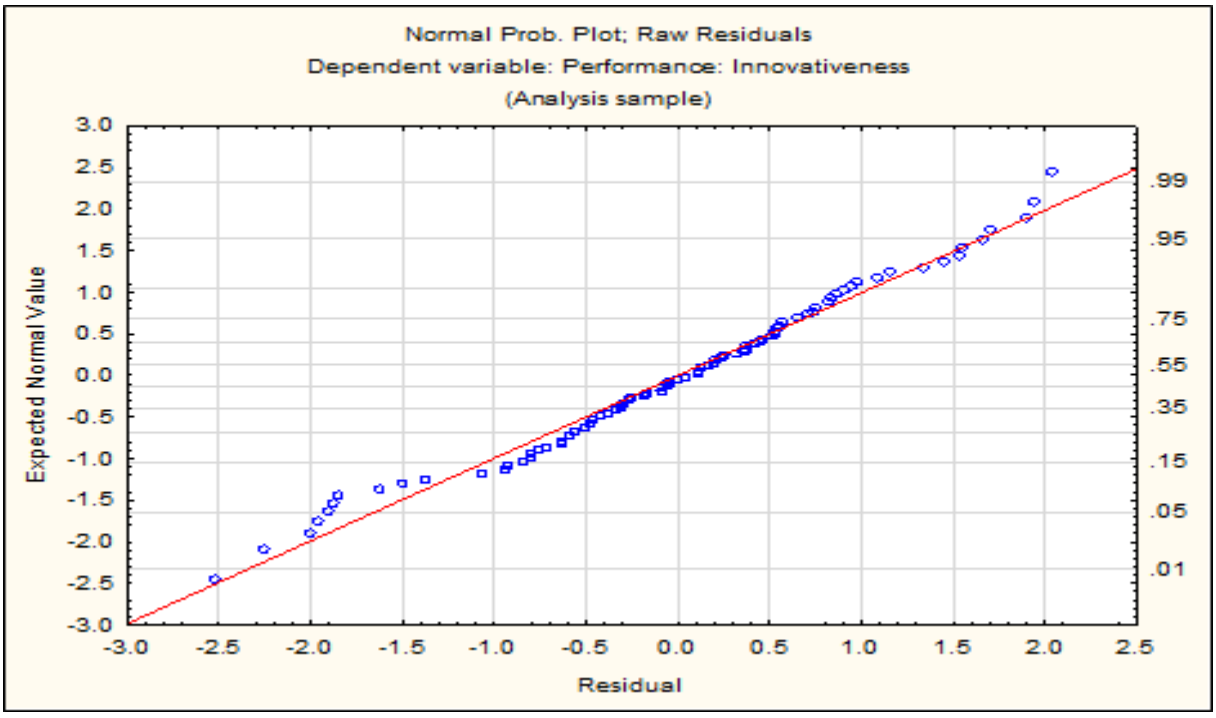

Figure 36: Normal probability plot: Effectuation vs Innovative performance

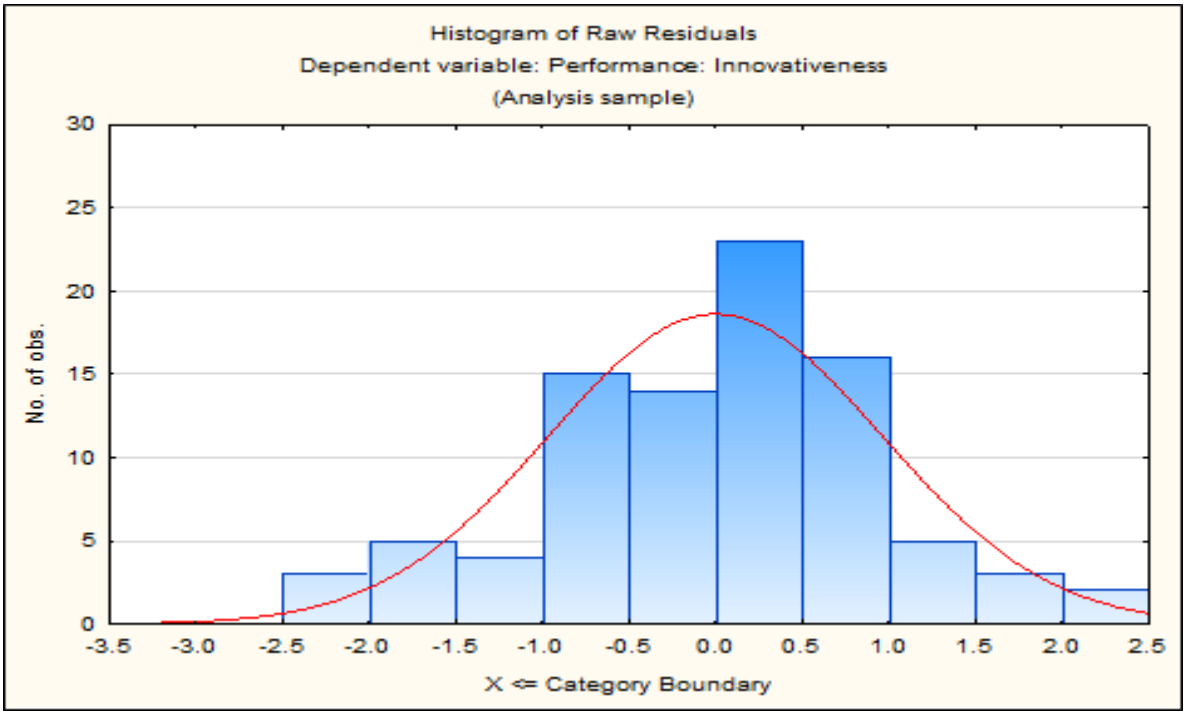

Figure 37: Histogram Residuals Flexibility vs Innovative Performance

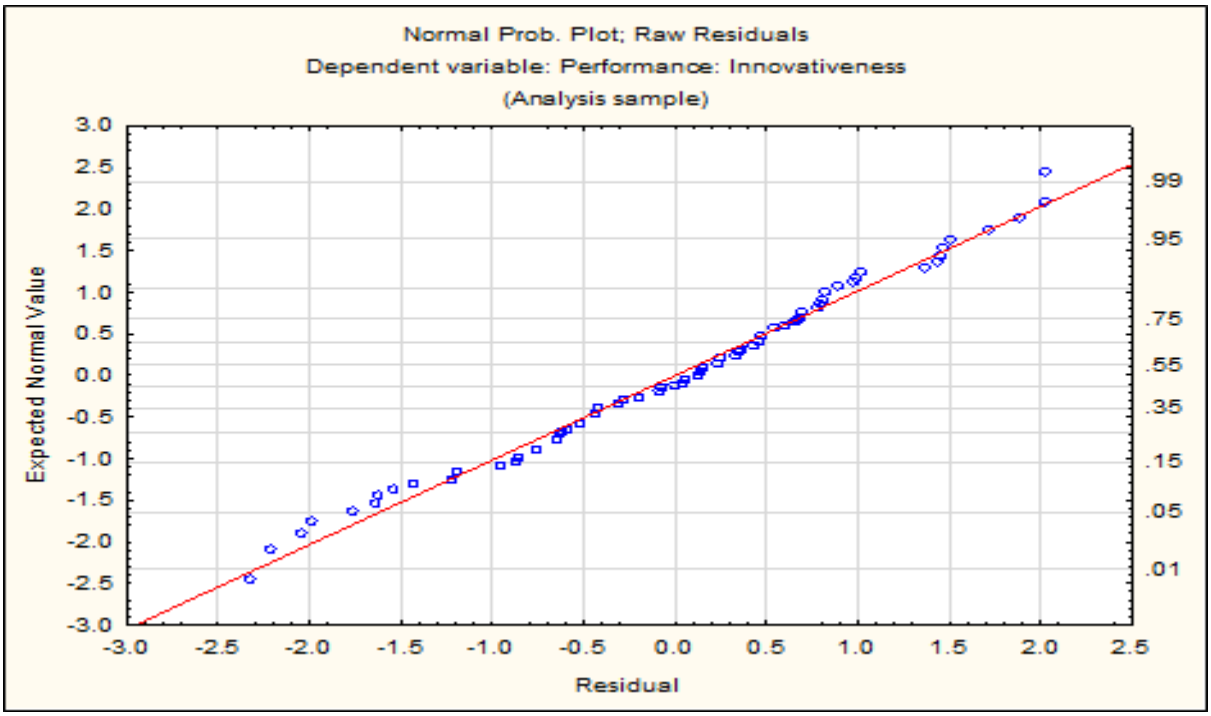

Figure 38: Normal probability plot: Flexibility vs Innovative Performance

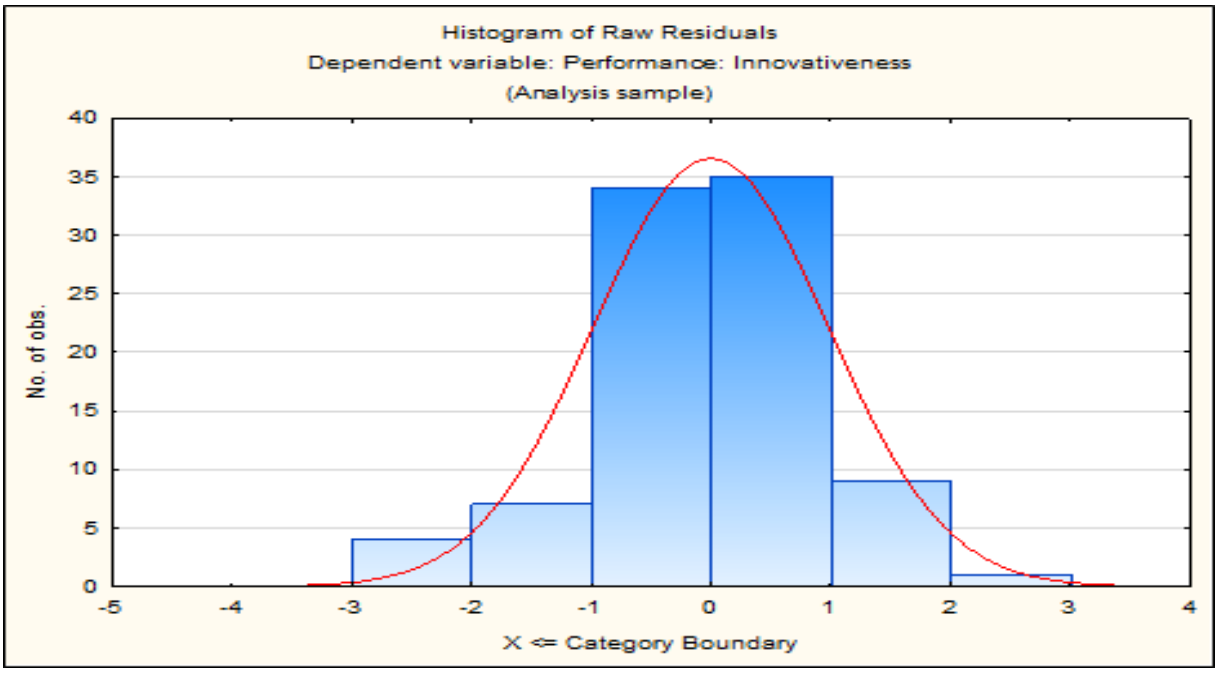

Figure 39: Histogram Residuals Experimentation vs Innovative Performance

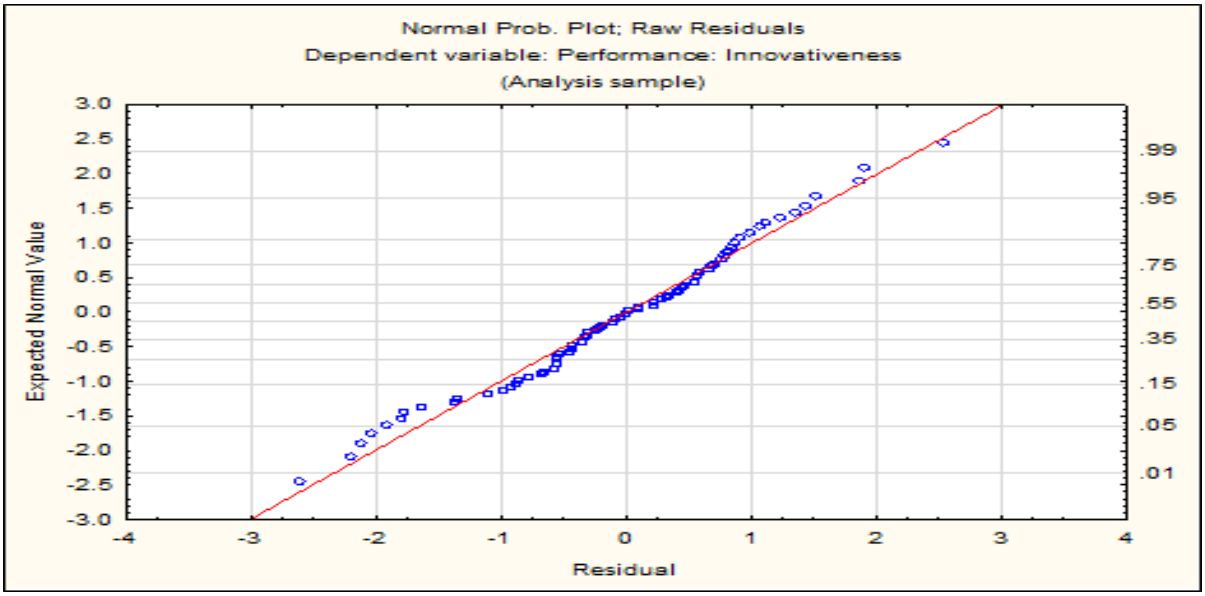

Figure 40: Normal probability plot: Experimentation vs Innovative Performance

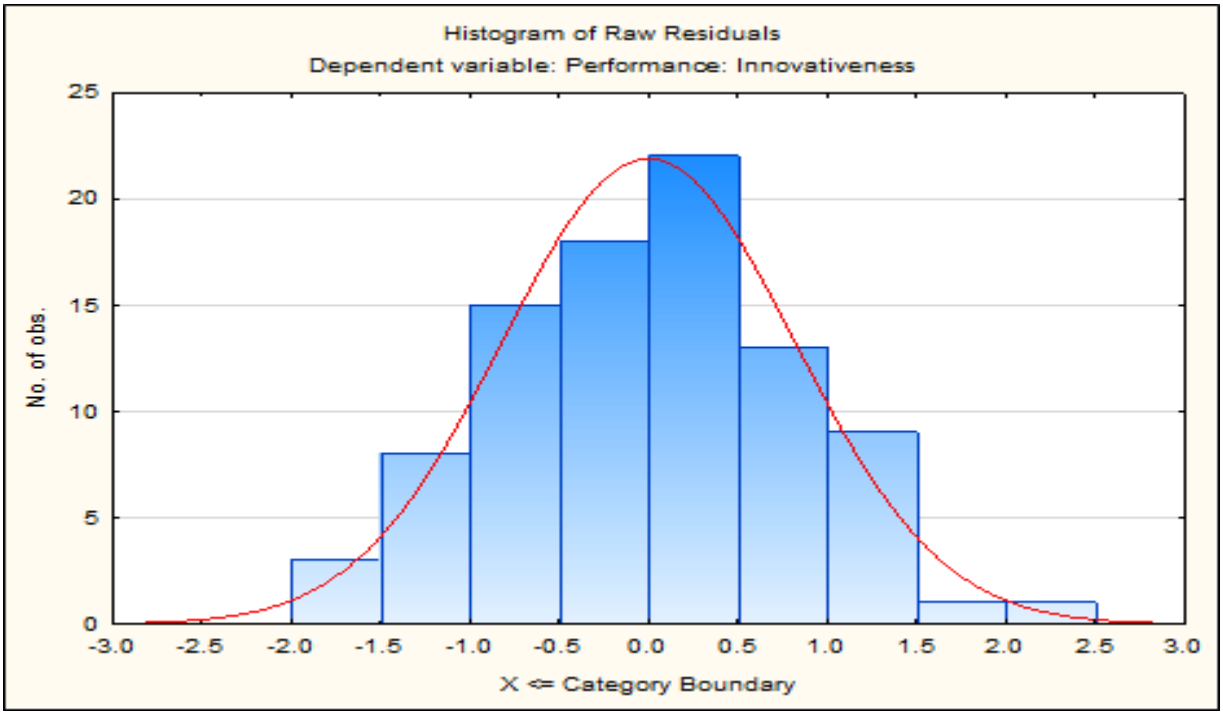

Figure 41: Histogram Residuals Effectuation as moderator

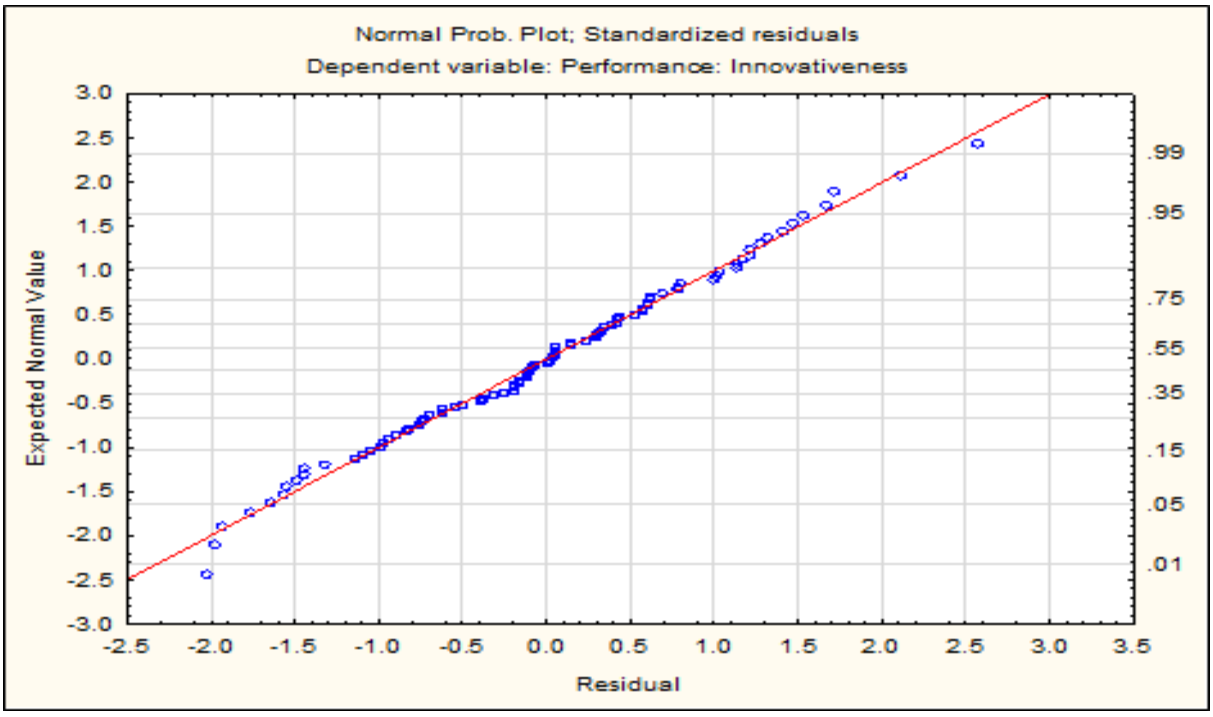

Figure 42: Normal probability plot: Effectuation as moderator

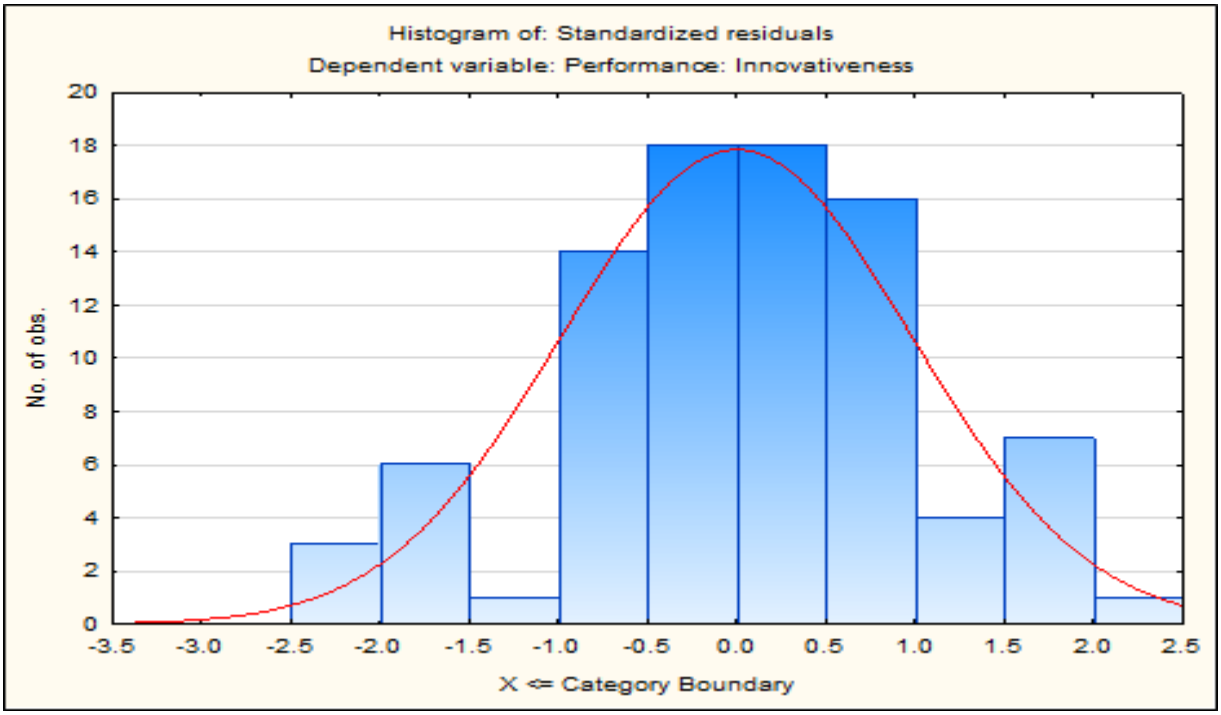

Figure 43: Histogram Residuals: Hostility as moderator

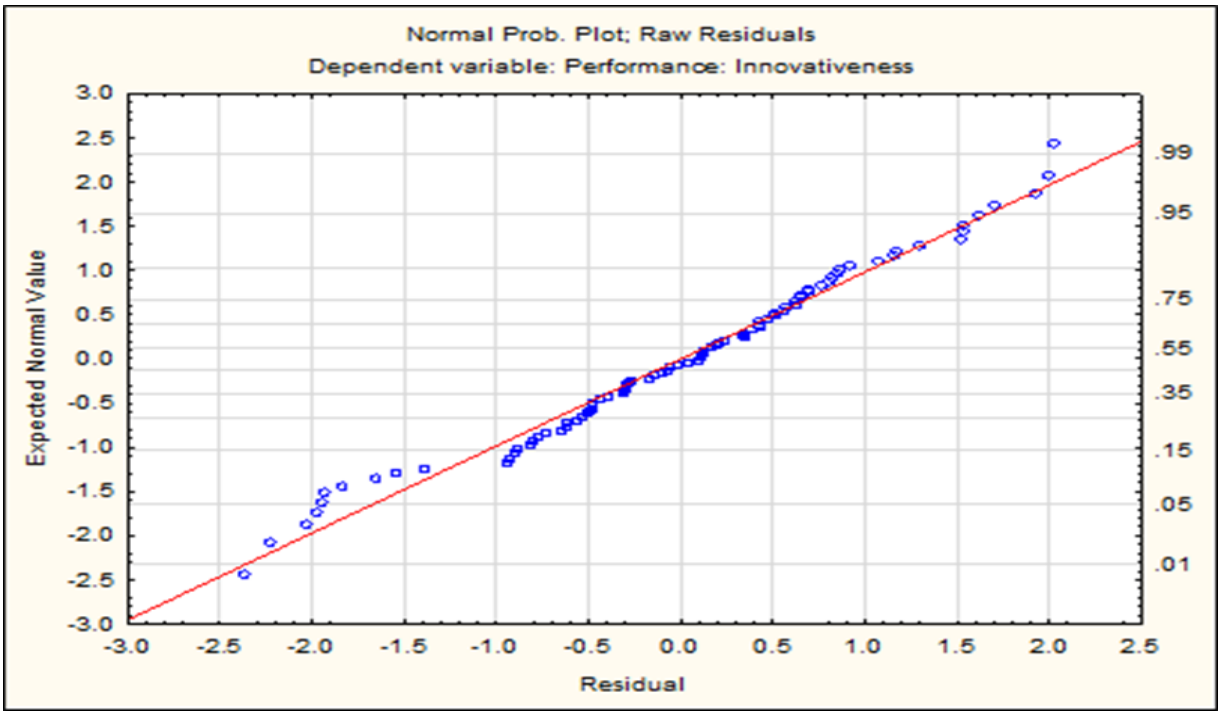

Figure 44: Normal probability plot: Hostility as moderator