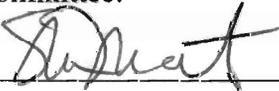


AN ASSESSMENT METHODOLOGY FOR PREDICTING THE SUCCESS OF  
TECHNOLOGICAL ENTERPRISES

by

Abeer Al-Hassan Abbas  
A Dissertation  
Submitted to the  
Graduate Faculty  
of  
George Mason University  
In Partial fulfillment of  
The Requirements for the Degree  
of  
Doctor of Philosophy  
Information Technology

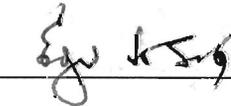
Committee:

  
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Dr. Sharon M. deMonsabert, Dissertation  
Director

  
\_\_\_\_\_

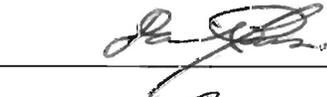
Dr. Andrew P. Sage, Committee Member

  
\_\_\_\_\_

Dr. Edgar H. Sibley, Committee Member

  
\_\_\_\_\_

Dr. Jean-Pierre Auffret, Committee Member

  
\_\_\_\_\_

Dr. Daniel Menascé, Associate Dean for  
Research and Graduate Studies

  
\_\_\_\_\_

Dr. Lloyd J. Griffiths, Dean, The Volgenau  
School of Information Technology and  
Engineering

Date: May 2, 2008

Spring Semester 2008  
George Mason University  
Fairfax, VA

An Assessment Methodology for Predicting the Success of Technological Enterprises

A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at George Mason University

By

Abeer Al-Hassan Abbas  
Masters of Science  
American University, 1997  
Bachelor of Science  
American University, 1994

Director: Doctor Sharon M. deMonsabert, Associate Professor  
Civil, Environmental, and Infrastructure Engineering Department

Spring Semester 2008  
George Mason University  
Fairfax, VA

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## DEDICATION

To

My mother, Massouma Ashkanani, who taught me that love can make anything happen

My father, Abdul-Kareem Al-Hassan, who believed that being just and humble will  
always give you piece

And

The honorable Kamal Sultan, whose beautiful spirit moves mountains to help one in need

With all my love ....

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## LIST OF ABBREVIATIONS

BIC	Business Innovation Center
CEO	Chief Executive Officer
CIO	Chief Information Officer
HSRB	Human Subject Review Board
IBK	Industrial Bank of Kuwait
IEEE	Institute of Electrical and Electronics Engineering
I2V	Invention to Venture
IPI	Independent Private Incubators
IT	Information Technology
ISO	International Organization of Standardization
KAI	Kirton's Adoption Innovation
KOM	Knowledge Oasis Muscat
KSPDC	Kuwait Small Project Development Company
MBA	Management Business Administration
MBTI®	Myers-Briggs Type Indicator
MIT	Massachusetts Institute of Technology
MTECH	Maryland Technology Enterprise Institute
NCIIA	National Collegiate Inventors and Innovators Alliance
NGO	Non-Government Organization
NSF	National Science Foundation
PAAET	Public Authority for Applied Education and Training
REEE	Roundtable on Entrepreneurship on Education for Engineering
SBIR	Small Business Innovation Research
SPSS	Statistical Package for the Social Sciences
TAM	Technology Acceptance Model
TEC	Technology Entrepreneurship Center
TRA	Theory of Reason Action
UBI	University business Incubation
UCF	University of Central Florida
UK	United Kingdom
WPI	Worcester Polytechnic Institute

## ABSTRACT

### AN ASSESSMENT METHODOLOGY TO PREDICT THE SUCCESS OF TECHNOLOGICAL ENTERPRISES

Abeer Al-Hassan Abbas, PhD

George Mason University, 2008

Dissertation Director: Dr. Sharon M. deMonsabert

Every year thousands of students and budding entrepreneurs participate in technical business plan competitions in over 44 institutions in the US alone. The stakes are high: over \$4 million dollars of prize money and hundreds of millions of dollars of venture capital are available. The evaluation process takes an average of 4 months to complete as the technical innovation, business plan, and personal traits of the entrepreneur are put to the test. How do each of these factors contribute to a winning proposal? Which is more important? How does the entrepreneur's personality contribute to the success or failure of a proposal? My research investigates the importance of these three criteria (technical value, business management plan, and personality) in the ranking of technical business plans. Business plan evaluations were collected from five separate university competitions. The statistical significance of incorporating the Jung's Personality Trait as a measure of entrepreneurial capability was estimated and is presented. The research findings suggest that the technical innovation is most significantly related to the proposal

ranking followed by the management concept and personality type of the entrepreneur. A multiple-linear regression model was developed to predict the rankings of business plan competitions using personality type, business value and technical value as the independent variables. The inclusion and exclusion criteria were specified in terms of a threshold value of the F statistic. The criteria for removal was set at 0.1 and for entry was set at 0.05. The coefficient of multiple correlation (adjusted R<sup>2</sup>) for the best predictive model was 0.939 for a regression through the origin. The predictive model was used to estimate the semifinalist rankings and to select finalists for a business plan competition whose data was not used in the model development. Predicted rankings were highly correlated with observed rankings (R<sup>2</sup>=0.88) and the model perfectly selected the top four finalists from a group of seven semi-finalists.

“Whatever the circumstances of your life, the understanding of type can make your perceptions clearer, your judgments sounder, and your life closer to your hearts’ desire”

Isabel Briggs Myers

## **Chapter 1: Introduction**

### **1.1 Research Background**

The meeting of the technical world with the business arena has produced many new buzzwords. The focus of this study is a marriage of the terms technology and entrepreneurship, commonly referred to as: “technical entrepreneurship” or “technological entrepreneurship.” For the purpose of this dissertation the term technological entrepreneurship and technical entrepreneurship are used interchangeably.

Public and private sector interest in technical entrepreneurship has been increasing globally. Governments have set aside funds and grants for innovative business ideas. International organizations such as the World Bank, the United Nations, and the Institute of Electrical and Electronics Engineering (IEEE) have recognized that technological innovations and entrepreneurship are an integral part of today’s industrialized nations. Renowned higher education institutions such as Stanford University, Purdue University, McGill University, and Massachusetts Institute of Technology track the technology market and the business aspects of technology. Today, it is safe to say that separate research efforts dedicated to technology and

entrepreneurship are underway. However, research on “technological entrepreneurship” as an entity unto itself is in its embryonic stages.

In 2001, the first of its kind, Roundtable on Entrepreneurship Education for Engineers (REEE) addressed research efforts in technology entrepreneurship. Marie Thursby of Purdue University noted the many issues that should be addressed. Many questions were posed including: What is technical entrepreneurship? Is it distinct from entrepreneurship? Why do we as engineers need to study it? Are there important empirical phenomena currently unexplained? What are the issues that are worth investigating? What are the challenges? What factors influence funding? (Thursby 2001)

McGill University’s Engineering Department defines technical entrepreneurship as the “innovative application of scientific and technical knowledge by one or several persons who start and operate a business and assume financial risks to achieve their vision or goal” (McGill University 2004). Similarly the National Collegiate Inventors and Innovators Alliance (NCIIA) define technical entrepreneurship as “the act of you and your team taking an invention all the way, or at least part of the way, to market yourself” (NCIIA 2006)

These technical entrepreneurship definitions highlight three main elements: (a) innovation and technology, (b) the people and (c) the business concept. My research considered technological entrepreneurship as a system composed of the above elements.

The study evaluated each of these elements, and their combined effect on the early success of a technological enterprise.

When technology becomes an element in an enterprise, the rules change. Technical or technological innovation, the technical entrepreneur, and the technological organization are distinctly different from non-technical business concepts. A technical venture has its own set of challenges to overcome. In addition to traditional market and financial barriers, technical enterprises must evaluate the feasibility of the technology, the adoption potential of the technology, and the integration of the technology into the market. Entrepreneurs must possess the technical skills necessary to perform these analyses. Technical entrepreneurs often come from an engineering, scientific, or information systems background. These individuals may or may not have the business acumen necessary to turn their technical innovation into a successful business venture. What distinguishes between a good engineer and the next Bill Gates? The term “technological entrepreneurship” is one imbued with its own special meaning and requires its own language for inception, execution, and evaluation.

Today, hundreds of Engineering and Science students compete in technology-based business plan competitions to gain funding for their prospective technological business ventures. Business Plan Competitions such as Massachusetts Institute of Technology’s (MIT) \$100K Competition, the Wharton Business Plan Competition, the Lunar Ventures New Enterprise Competition, the Licensing Foundation Graduate Student

Business Plan Competition, and hundreds of other competitions go through a rigorous process to determine the winner of each competition. Many such competitions can last for months before final selections are made. Appendix A contains technical business competition timeline for institutions that host business plan competitions. Are the processes used by these various institutions to evaluate new technical ventures similar? What do they have in common? What criteria are used most frequently? What can be learned about technical entrepreneurship from studying and comparing these competitions and their results? Is there a better way of evaluating technical enterprises in early stages?

## **1.2 Statement of the Problem**

This research investigates the factors that contribute to the success of a technological enterprise in the early stages of the startup. At present, there are no studies which have examined the success of a technological enterprise as influenced by the value of the technological idea, the soundness of the business concept, and the personality of the founder/entrepreneur. Most importantly, the influence of the personality type of the founder on the success of the proposed venture has yet to be studied. Finally, there is little research that investigates the synergy of the personality type, business plan and technical concept.

Evaluators routinely look at business plans and determine whether the financials, marketing, and management team are sound and if the business concept is achievable. Many institutions have scoring criteria for the technical innovation as well as the business plan. Appendix B contains a sample of the scoring or evaluation sheets. Because of the lack of research and material on this topic, evaluators of technological business plans are not sure of the best assessment method. The evaluators may be able to judge technical feasibility, just as they would be able to evaluate the soundness of a business plan, but evaluation of the ability of the entrepreneur is highly subjective.

In a typical business plan competition, the evaluators score or rank the technical feasibility and the business concept, then combine the scores to determine whether a particular business concept warrants further consideration. They may even go so far as to rank the proposed ventures. Some evaluators may attempt to evaluate the founder's ability based on appropriate technical or business experience. Subjective evaluation of the founder may result during the oral presentation of the business plan. However, there are no models that systematically incorporate the personality of the business founder into the evaluation of the technical business plan. Similarly there are no instruments for providing feedback regarding the personality and its potential impact on a business plan competition.

There are no measurable criteria that may be used to evaluate the suitability of the personality of the founder without conducting an interview. Unfortunately, even an

interview can be highly misleading. A great presenter may represent a good communicator but a poor technical decision maker. Similarly, a quiet and reserved individual may present a highly innovative technical idea, yet lack the ability to charm the evaluators during an interview. How does the personality of the entrepreneur influence the evaluators? How can the personality be measured and modeled as a significant factor in the scoring and ranking of new technical ventures?

### **1.3 The Objective of the Research**

The purpose of this research is to develop a statistically significant model that can be used to predict the short term success of a technical startup based on measures of the technical innovation, the business plan, and the personality of the founder or technical entrepreneur. “Short term success” will be measured in terms of the ranking within technical business plan competitions. The objective of the research is to show that there is a statistically significant relationship between the ranking of a new technical venture and the personality of the entrepreneur. The goal of the study is to develop a model that can successfully emulate the business plan evaluation and ranking process. An improved understanding of the parameters that contribute to a highly ranked business plan may help to eliminate potential weaknesses. Similarly, the developed model may be used to improve the evaluation process of early startups.

## **1.4 Scope of the Problem**

Technical entrepreneurship, like any system, has a context and an external environment. This study focuses on early startup success as measured by business plan competitions. The attributes of the technical innovation, business plan, and entrepreneur associated with technical business plan competitions are studied. The research does not attempt to address the external environment, which includes social, religious, and cultural factors. As these were studied under previous efforts (Balachandra 1997; Åstebro 2004; Galbraith, et al. 2006). The study focuses on the combined value of the market opportunity and size, financial soundness, management experience of the team, viability, competitive advantage and the characteristics of the personality of the technical entrepreneur.

## **1.5 Thesis Statement**

Early success of a technological venture can be statistically modeled using the value of three measures: Technical Innovation, Business Management Plan, and Entrepreneurial Personality of the Founder.

## **1.6 Benefits of the Research**

The benefits of the research are many. Understanding the important attributes of a successful technical business plan will:

- Help government agencies, universities, funding institutions, and venture capital firms in perfecting their technical venture evaluation techniques.
- Help companies to better assess new internal initiatives and the proposed leadership.
- Help founders to know their own strengths/weaknesses to enable them to better partner with someone who can compliment their abilities.
- Help expedite new technical ventures to market by replacing the traditionally slow business plan evaluation and interview process. In technology, the time to market is critical because technology is constantly improving and changing.

## **1.7 Organization of the Dissertation**

The dissertation is divided into five chapters. A brief description of the content of each chapter follows.

**Chapter 1: Introduction** - Provides the basic intent and purpose of the research. The Introduction begins with a brief description of the research background, followed by a statement of the problem, the objective of the research, the scope of the study, and finally the benefits of the research.

**Chapter 2: Literature Review** – The Literature Review provides background on the technical enterprise itself, including the history, definition and success factors of technical enterprises in the United States and around the world. The Literature Review presents an overview of models that describe both technology and personality. The traditional factors and methodologies used in business plan competitions are also reviewed.

**Chapter 3: Research Methodology** – This chapter begins with the problem statement and is followed by the research hypothesis. The research questions that are answered in the thesis are listed and the approach for collecting, analyzing and modeling the data is detailed. Study participants and the specific data to be collected are articulated.

**Chapter 4: Data Collection and Analysis** – Chapter 4 will begin with displaying the results of the data collection. The numerical and graphical results of the statistical analyses are presented in conjunction with a discussion of the findings. This chapter concludes with a discussion of the potential applications of the findings.

**Chapter 5: Research Conclusion and Contribution** – The final chapter contains a summary of the research effort and its contribution to the field of technical entrepreneurship. The limitations and risks of the findings are outlined. Recommendations for future work are suggested.

## **Chapter 2: Literature Review**

The literature review reviews studies and models that are relevant to the development of an entrepreneurial model. It covers the factors that contribute to the success of technical ventures. Moreover it covers evaluation techniques that are currently used in entrepreneurship centers, technology parks, and business plan competitions. Limitations of the current techniques are identified as gaps in the literature.

### **2.1 Success Factors of Enterprises**

#### **2.1.1 Definition of Success**

Success is a broad term. If one looks up the term “success” in a dictionary many definitions will surface. The Online American Heritage Dictionary<sup>1</sup> defines success as:

- The achievement of something desired, planned, or attempted.
- The gaining of fame or prosperity.

Similarly, WorldNet<sup>2</sup> defines success as:

- An event that accomplishes its intended purpose.
- A state of prosperity or fame.

---

<sup>1</sup><<http://dictionary.reference.com/browse/success>> 6 Dec. 2006

<sup>2</sup><<http://dictionary.reference.com/browse/success>> 13 Dec. 2006

Merriam-Webster<sup>3</sup> defines success as:

- Favorable or desired outcome.
- The attainment of wealth, favor, or eminence.

Because the degree or the measure of success may differ from one person to another, for this research, a definition - broad or specific - needs to be identified. Many may agree that wealth can be a good indicator of success for businesses, but how do we determine how much wealth is considered successful? What about companies that have been around for 30 years and did not reach their first million, are they considered successful?

Brockhaus (1982) discusses ways to measure success in entrepreneurs. His definition of success is close to that found in the American Heritage Dictionary – *The achievement of something desired*. Brockhaus believes that success is a relative concept that can be measured in various ways. He ties the success of an entrepreneur to the fulfillment of goals. If the entrepreneur's goal is to work for herself and generate enough income to support her lifestyle, then she is successful. If the entrepreneur's goal is to have a chain of businesses and a fortune and she achieves this goal, then the entrepreneur is successful. In other words, it is only the entrepreneur's vision of what she desires from her enterprise that indicates her success (Brockhaus, 1982).

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<sup>3</sup> <<http://dictionary.reference.com/browse/success>> 13 Dec. 2006

A venture capitalist may feel that attaining success is through wealth, as also defined by the Merriam-Webster dictionary. Venture capitalists may measure success through the financial predictions of an enterprise; they anticipate a return on their investment. Therefore, success in this setting is a monetary achievement, not a personal one. To venture capitalists, a way to measure the success of a business in which they are investing is by looking at their economic gain.

A not-for-profit organization's perception of success will most likely differ from that of a venture capitalist's definition who measures success by attainment of wealth. The entrepreneur measures success by attainment of goals. A non-profit organization may measure its success according to WorldNet's definition of success - *an event that accomplishes its intended purpose*. The way non-profit organizations measure their success is by ensuring that projects that they are working on will be accomplished. An example for this would be the building of computer laboratories in schools of underdeveloped countries. A not-for-profit organization is an enterprise that considers projects successful if and when they reach their intended purpose.

From the above definitions we can say that there is a broad sense of what could be meant by success to a particular entity; however, this study is not concerned with the definition of success as the achievement of goals, monetary achievement or even completion of a project in the long term. In general, the success of an entrepreneur or enterprise may be one or all of the above definitions. This study is concerned with the

short-term success of technical start-ups. In this case, ‘success’ refers to the granting of funds by an institution, which in turn may encompass the above three definitions of success at an early stage. First the achievement of goal can be accomplished by receiving positive reviews on a technological business plan or winning a business plan competition. Secondly, success might have a monetary reward such as winning a sum of money in a business plan competition or being recommended for a start-up grant. Thirdly, achieving an intended goal might be realized by receiving the funding necessary to begin a life long dream. For the purpose of this thesis, when using the term “success” it refers to the “short-term success” or “initial success” that is also taking place at the solicitation and funding phase of the entrepreneurial process. It is important to note that initial success does not necessarily predict ultimate success (Stuart and Abetti 1987). However, it is a good place to begin an analytical study of technical entrepreneurship.

### **2.1.2 Models of Success**

The factors that could determine the viability of an enterprise have been researched by many scholars. Predicting the ability of a business to grow, expand, and develop is the hope of many entrepreneurs and the goal of many venture capitalists. Entrepreneurs and venture capitalists alike would feel more comfortable if there was a blueprint for success – a methodology or a model that may help in developing and guiding their business concept. Moreover, if venture capitalists have elements that may

predict success based on previous research and past experiences, it will definitely enhance their ability to minimize risk when investing in a venture.

Most business ventures start with an idea. Two people may have the same idea at the same time, and both of them may launch a similar venture such as a software development company. Company A may survive and Company B may not. What did Company A possess that B did not? Is it the personality and characteristics of the owner, is it the management experience or the financial plan, or possibly the innovation in the product or service?

Brüderl, et al. (1992) have grouped some factors that they believe affect the success of a newly launched business from previous research<sup>4</sup>. They grouped the factors into three categories: (1) the human capital: the founder's individual characteristics; (2) organizational characteristics: lead time, size, and strategies; and (3) environmental conditions: location, branch of industry, market condition. They based their study on previous research and their own analysis. They interviewed 1,849 business owners from a sample of 4,320 registered businesses in Munich, Germany (Brüderl, et al. 1992). Table 2-1 provides a description of the variables that are believed to effect the survival of a new venture by Brüderl, et al. (1992).

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<sup>4</sup> These Group factors were extracted from four studies by (Szyperski and Nathusius 1977; Klandt 1984; Aldrich and Zimmer 1986; Schussler and Voss 1988);

**TABLE 2-1: Description of Variables (Brüderl, et al. 1992)**

<b>Variable</b>	<b>Description</b>	
Human Capital Resources of Founder	General Human Capital	Years of Schooling Years of Work Experience
	Specific Human Capital	Industry-Specific Experience Self Employment Experience Leadership Experience Self Employment of Father
Organizational Characteristics	Newness Initial Size Organizational Strategies	
Environmental Conditions	Location Branch of Industry Market Conditions	

The result of the study concluded that the human capital resource of the founder, which is the years of schooling and work experience, significantly improved the survival rate of a new business. Moreover, the study found that business founders who have specific human capital such as industry-specific experience, self-employment experience, leadership experience, and parents that owned their own business are more likely to survive than the businesses with founders that do not have these variables (Brüderl, et al 1992).

The results for organizational characteristics also showed that late-comer businesses have a lower failure rate than newcomers. The study also concluded that the size of a business played a significant part: the smaller the size, the less the chance of survival. As to the strategies, results showed that specialist businesses, innovative organization, and businesses aimed at national markets have a higher rate of survival (Brüderl , et al. 1992).

The environmental conditions of a firm also play a significant part when it comes to the survival of a new business. The results for firms located in different areas showed that one geographical area may have a higher survival rate than another location. Moreover, different branches in a market may determine the chance of failure of a firm. Finally, the study also analyzed the market conditions and found that businesses that are seasonal and the ones that are highly competitive have a higher failure rate (Brüderl, et al. 1992).

Roure and Keeley (1990) studied elements that may lead to the prediction of success in new technology-based businesses. From several studies that examined the causes of success and failure of new businesses, a three-part analysis followed. Emphasis was directed on the following factors: the management, venture strategy and competitive environment. One of the most significant findings was that technology based businesses faced tremendous uncertainties and time pressure, and their ability to respond to those challenges may be a good indicator of their success or failure (Roure and Keeley, 1990).

Based on 20 earlier studies, Lussier and Corman (1995) analyzed 15 variables to see the differences between successful and failed start-ups. Their findings indicated that only four of the 15 variables showed a significant difference between success and failure. The four significant variables were: staffing inadequacy, planning, availability of advisors, and level of education (Lussier and Corman, 1995). The variables studied are described in Table 2-2.

**TABLE 2-2: Success and Failure Variables (Lussier and Corman, 1995)**

<b>EXPLANATION OF SUCCESS VERSUS FAILURE VARIABLES</b>	
<b>Variables</b>	<b>Definition</b>
Capital	Businesses that start undercapitalized have a greater chance of failure than firms that start with adequate capital
Record Keeping and Financial Control	Businesses that do not keep updates and accurate records and do not use adequate financial controls have a greater chance of failure than firms that do.
Industry Experience	Businesses managed by people without prior industry experience have a greater chance of failure than firms managed by people with prior industry experience
Management Experience	Businesses managed by people without prior management experience have a greater chance of failure than firms managed by people with prior management experience
Planning	Businesses that do not develop specific business plans have a greater chance of failure than firms that do
Professional Advisors	Businesses that do not use professional advisors have a greater chance than firms using professional advisors
Education	People without any college education who start a business have a greater chance of failure than people with one or more years of college education
Staffing	Businesses that select product/service that are too new or too old have a greater chance of failure than firms that select products/services that are in the growth stages.
Product/Service Timing	Businesses that select product/service that are too new or too old have a greater chance of failure than firms that select products/services that are in the growth stages.
Economic Timing	Businesses that start during a recession have a greater chance of failure than firms that start during expansion periods.
Age	Younger people who start a business have a greater chance of failure than older people starting a business
Partners	Business owners whose parents did not own a business have a greater chance of failure than owners whose parents did own a business
Minority	Minorities have a greater chance of failure than non-minorities
Marketing	Business owners without marketing skills have a greater chance of failure than owners with marketing skills

Shepherd (1999) used literature on venture capitalists' decision making and the criteria that were recommended to investigate whether venture capitalists' assessment processes are in line and consistent with the literature. The finding of the study showed that the assessments used by venture capitalists were consistent with the literature and criteria that were proposed by scholars. The three main factors that the study focused on were: the nature of the market (stability and time of entry, lead time); competition (competitive rivalry, industry related competence); and management decision

(educational capability). The results showed that all the above factors were significant in the assessment of venture survival, with the exception of long lead time that showed no significance (Shepherd, 1999). The key success factors and control variables are shown in Table 2-3.

Åstebro (2004) investigated the key success factors for technological entrepreneurs to consider when screening early stage R&D projects. He examined previous studies and how they may have attempted to predict the success factors for those products. He examined the impact of 36 innovation, technology, and market characteristics on R&D projects that may lead them to market success. He studied previous data and work developed by 516 technological entrepreneurs. He was able to conclude that four characteristics stood out as predictive. Those characteristics are: expected profitability, technological opportunity, development risk, and appropriate conditions. Using the above predictors his model claimed to predict future success with an accuracy of 80.9% (Åstebro 2004).

**Table 2-3: Attributes for Assessment of New Venture Survival (Shepherd 1999)**

<b>Criteria</b>	<b>Levels</b>	<b>Definition</b>
<b>KEY SUCCESS FACTORS</b>		
<b>Stability</b>	High	Requirements necessary for success will not change radically during industry development
	Low	Requirements necessary for success will change radically during industry development
<b>Timing of Entry</b>	Pioneer	Enters a new industry first
	Late Follower	Enters an industry late in the industry's stage of development
<b>Lead Time</b>	Long	An extended period of monopoly for the first entrant prior to competitors entering the industry
	Short	A minimal period of monopoly for the first entrant prior to competitors entering this industry
<b>Competitive Rivalry</b>	Long	Intense competition among industry members during development
	Short	Little competition among industry members during industry development
<b>Educational Capability</b>	High	Considerable resources and skills available to overcome market ignorance through education
	Low	Few resources and skills available to overcome market ignorance through education
<b>Industry Related Competence</b>	High	Venture has considerable experience and knowledge with the industry being entered on a related industry
	Low	Venture has minimal experience and knowledge with the industry being entered on a related industry
<b>CONTROL VARIABLES</b>		
<b>Scope</b>	Broad	A firm that spreads its resources across a wide spectrum of the market, e.g., many segments of the market
	Narrow	A firm that concentrates on intensively exploiting a small segment of the market, e.g., targeting a niche
<b>Entry Wedge Mimicry</b>	High	Considerable imitation of the mechanisms used by other firms to enter this, or any other industry, e.g., a franchisee
	Low	Minimal imitation of the mechanisms used by other firms to enter this, or any other industry, e.g., introducing a new product

Another study by Davis and Zweig (2005) showed that there are a number of basic components of success for any start-up in general and an IT startup in particular. Their study focused on the following success components: the market, an appropriate product or service, financial resources, and a solid management team. The study focused on an IT startup in Colorado Springs – Omni-Vista, Inc., which was launched in 1998 and folded in 2002. It emphasized the importance of the above factors to the success of a technological enterprise and particularly one in the software arena (Davis and Zweig, 2005).

Previous studies focused on a variety of elements, and each may have a limited focus (applicable to IT or R&D companies only) or may neglect elements that might affect a technological enterprise. Moreover, these studies were performed independently using different methods of analysis and different samples. Using the over 100 identified success factors as a guide may prove to be overwhelming; the literature suggests the need for a more focused study that concentrates on the business development approach, innovative idea and the person involved in founding and running this enterprise.

Balachandra and Friar (1997), Åstebro (2004), and Galbraith, et al. (2006), all agreed that even though many studies do disagree on the success elements, the general consensus and notion points to the agreement of all the authors on the following factors that are important for success: the market, technology, environment, and organizational characteristics.

For example, the human capital resource of the founder analyzed by Brüderl, et al. (1992) was extremely important but falls short of some characteristics that may be needed for a person who is running a technological enterprise – technical abilities and experience.

## **2.2 Overview of Technical Entrepreneurship**

It is very important to recognize that technological entrepreneurship can be traced back to the Greek Civilization as early as 1450 BC. The Ancient Greeks were among the first to build bridges and highly advanced drainage systems for showers. They also wove and dyed clothes as well as built irrigation systems. They demonstrated their skills as engineers through this technological advancement. Because of their technical advances they were believed to be the first to produce an agricultural surplus that they exported (Nelson 1999).

### **2.2.1 Definition of Technical Entrepreneurship**

McGill University's Engineering Department defines technical entrepreneurship as the “innovative application of scientific and technical knowledge by one or several persons who start and operate a business and assume financial risks to achieve their vision or goal” (McGill University, 2004). The National Collegiate Inventors and Innovators Alliance (NCIIA) define technical entrepreneurship as “the act of you and

your team taking an invention all the way, or at least part of the way, to market yourself” (NCIIA 2006). It is interesting to note that this definition is focused on the entrepreneur as opposed to the innovation.

To develop a foundation for this research in technical entrepreneurship, the terms: “entrepreneur”, “technical or technology,” and “entrepreneurship” are explored.

### **2.2.1.1 Entrepreneur**

The term “entrepreneur” comes originally from a French word, *entreprendre*, which means *to undertake*. It originated in French economics as early as the 17<sup>th</sup> and 18<sup>th</sup> centuries. The first definition of the term can be traced to the French economist named Jean Baptiste Say. Say defined “the entrepreneur” as a person who “shifts economic resources out of an area of lower and into an area of higher productivity and greater yield” (Drucker 1993). Many attempted to answer the questions: who is an entrepreneur. In a business context, Joseph Schumpeter, an Austrian economist states that an entrepreneur drastically changes the pattern of production by “exploiting an invention or, more generally, an untried technological possibility for producing a new commodity or producing an old one in a new way, by opening up a new source of supply of materials or a new outlet for products by recognizing and industry”(Dees 2001).

The National Collegiate Inventors and Innovators Alliance (NCIIA) states that the entrepreneur, first identifies market opportunities and then creates an invention or a solution to these opportunities. Then the entrepreneur must acquire the money, people and equipment needed to build a successful venture. Afterward, he or she must manage the resources and the associated risks that come with the venture (NCIIA 2006).

### **2.2.1.2 Technology**

The following are some definitions of technology. Webster defines technology as a science of systematic knowledge of the industrial arts, especially as applied to the more important manufacturing industries (Webster's II 2004). University of Georgia defines it as a complex social enterprise that includes not only research, design, and/or crafts, but also finance, manufacturing, management, labor, marketing, and maintenance.<sup>5</sup> Tech Encyclopedia defines Technology as applying a systematic technique, method or approach to solve a problem<sup>6</sup> (TechEncyclopedia 2008).

Most definitions of technology highlight a systematic approach in the assembling of products that assist humanity in the creation of repeatable processes that maximize efficiency. Each definition emphasizes, to varying degrees, not only the product but the application of that product. The first definition states that there must be “applications of

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<sup>5</sup> <<http://www.uga.edu/teched/conf/standards.htm>>, University of Georgia, 14 Apr. 2008.

<sup>6</sup> <<http://www.techweb.com/encyclopedia/>>, United Business Media, LLC, 14 Apr. 2008.

principles.” The second requires a “systematic knowledge”, the third, the “finance, manufacturing, management, labor, marketing, and maintenance,” while the last stresses the “approach to solve a problem.” In other words, it is not only the manufacturing of an item that is relevant but its proper placement and/or application in the real world that defines its significance.

### **2.2.1.3 Entrepreneurship**

Many researchers have expressed their definition of the term “entrepreneurship.” They vary from the simple, entrepreneurship is “the creation of organizations” (Gartner 1988) to a more sophisticated, "entrepreneurship is the process of identifying, developing, and bringing a vision to life” (Page Entrepreneurship Center at Miami University of Ohio, 2005). The vision may be an innovative idea, an opportunity, or simply a better way to do something. The end result of this process is “the creation of a new venture, formed under conditions of risk and considerable uncertainty.”<sup>7</sup>

Schumpeter also placed an emphasis on innovation of new products, new production methods, new markets and new forms of organization. He says that “wealth is created when such innovation results in new demands”<sup>8</sup>.

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<sup>7</sup> [http://westaction.org/definitions/def\\_entrepreneurship\\_1.html](http://westaction.org/definitions/def_entrepreneurship_1.html) 7 May 2005

<sup>8</sup> <http://www.quickmba.com/entre/definition/> 4 Mar. 2005

## 2.2.2 Elements of Technical Entrepreneurship

Many “how to” books have been written for scientists and engineers on becoming an entrepreneur. Enterprising scientists and engineers read such books in hopes of enhancing their business and entrepreneurial skills. Many believe that entrepreneurship can be taught. Peter Drucker, for example, wrote that “everyone who can face up to decision making can learn to be an entrepreneur and behave entrepreneurially” (Drucker, 1993).

The National Collegiate Innovators and Innovators Alliance (NCIIA) define entrepreneurship as the “process of organizing and assuming the risk for a business venture.” (NCIIA 2006) Baron and Shane (2005) portray entrepreneurship as a process that is made up of the steps listed below and further illustrated in Figure 2-1.

Idea for new product or service and/or opportunity recognition

1. Initial decision to proceed
2. Assembling the required resources (information, financials, people)
3. Actual launch of new venture
4. Building a successful business
5. Harvesting the rewards

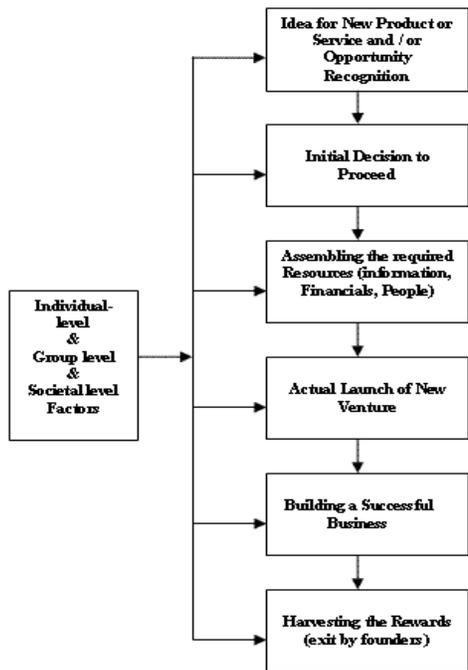


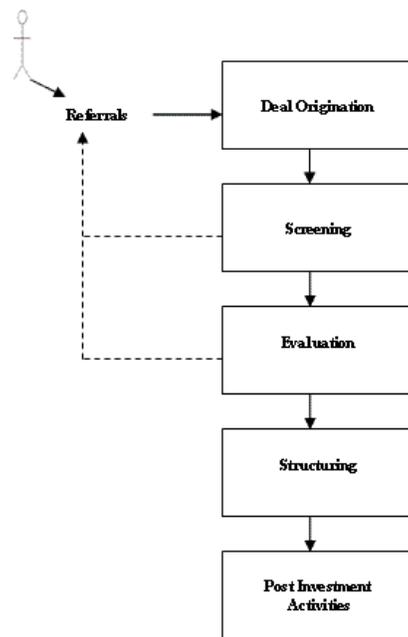
FIGURE 2-1: The Entrepreneurial Process (Baron and Shane, 2005)

This model can be affected by variables at several levels: individual, group, and societal. Individual level variables are the skills, motives, and personal characteristics of entrepreneurs. Group level variables include ideas, input from others, effectiveness in interactions with venture capitalists, customers, and potential employees. Societal level variables that influence the steps highlighted above are: government policies, economic conditions, and technology (Baron and Shane, 2005). Societal mechanisms include external mechanisms and controls that are outside of the control of a technological enterprise. For example, government policies may have a considerable impact on success.

Such a case was witnessed in Saudi Arabia in 2004 when a ban on camera phones threatened the life of many small mobile phone companies (Mishkhas, 2004).

It is the job of venture capitalists to predict the success of business ventures. Their livelihood depends on a successful appraisal of new ventures. Models that predict the success of a business idea/plan are particularly of interest to venture capitalists. Tyebjee and Bruno (1984) presented an assessment model to help venture capitalists predict the success or failure of new ventures. The five-step process documented by Tyebjee and Bruno (1984) is:

1. Deal origination: this is when deals are being considered
2. Deal screening: a preliminary screening of projects in limiting the scope of ventures to familiar areas to the venture capitalist such as: technology, product, or market scope.
3. Deal evaluation: a risk assessment is conducted based on the business plan. A multidimensional evaluation of a set of characteristics will be considered for computation for expected rate of return.
4. Deal structure: a construction of an entrepreneur/venture capitalist's investment agreement.
5. Post-investment activities: a venture capitalist's role changes from an investor to a collaborator.



**FIGURE 2-2: Decision Process Model of Venture Capitalist Instrument Activity (Tyebjee and Bruno, 1984)**

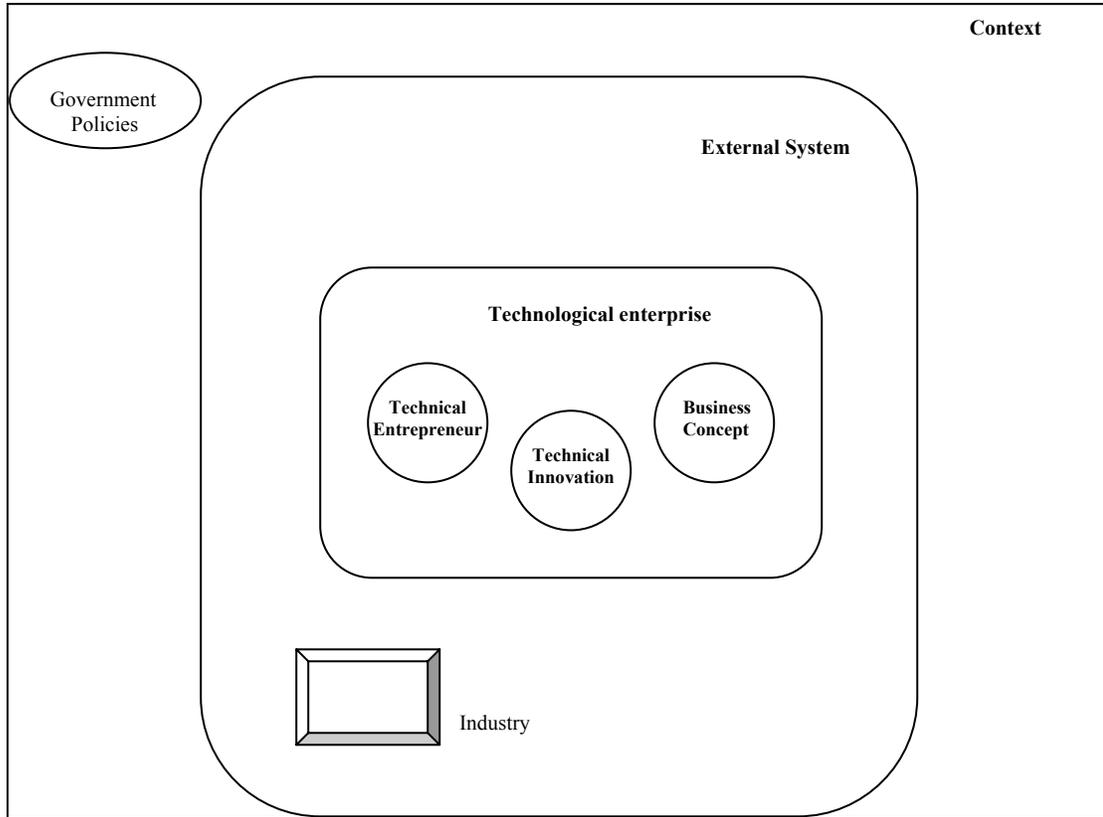
Funding or investing in a new venture is very different from investing in an existing venture that needs funds to expand. A new venture has no history so a venture capitalist has nothing to rely on, except for the business concept plans and studies that have been performed. A model that can predict the success of an enterprise based on certain elements, with a high level of confidence, will help in formulating a decision to invest. In the Tyebjee and Bruno study (1984) they discuss the phases that are involved in a venture capitalist's investment activity. In the evaluation phase of that model they recognized all the elements that venture capitalists consider when assessing a business plan. These elements are considered to be the predictors of a business success or a good guide to consider when evaluating one. They base their evaluation on characteristics that

were found to be important by previous research. The elements that are considered in the evaluation of a business are also part of the technical entrepreneurship system.

For the purpose of this study, technical entrepreneurship is recognized as an “innovative application of scientific and technical knowledge by one or several persons who start and operate a business and assume financial risks to achieve their vision or goal” (McGill University, 2004). Technical entrepreneurship is also viewed as a system. Buede (2000) states that a system is both affected by an external environment and is located within some context. In recognizing that technical entrepreneurship is a system, the processes and elements involved in this system and acting upon the system will be examined as shown in Figure 2-3.

Technical entrepreneurship is a combination of people and ideas that are operating within a very [complex] system; therefore evaluating the technical enterprise that exists in some external system is complicated. In order evaluate the likelihood of success and set a well-defined methodology and assessment of a technological venture, many elements need to be considered. First, there must be an evaluation of the technology. Second, the technical entrepreneur who is starting the venture should be evaluated. Third, the business concept needs to be examined closely. The immediate environment (external system) is the industry in which the enterprise functions. The enterprise must be a success within this environment. This research will involve the review of the entrepreneur, concept and innovation by the industry. The policies that

affect the enterprise are outside of the scope of this paper. However, it is realized that this may be a critical variable as discussed above.



**FIGURE 2-3: Technical Entrepreneurship as a System**

In the following sections, the study will focus on the key elements that will be examined in this research. A definition and scope for the following elements are provided:

1. The Technological innovation
2. The Business Concept
3. The Technical Entrepreneur

### **2.2.2.1 The Technological Innovation**

Any new technological innovation, at the time they are created and introduced to the market, can be considered innovative. Of course, as time passes, the new ideas that were once technically innovative become commonplace and eventually obsolete.

Technological innovation is a fairly recent term. People in the media use the term innovation to mean new technologies. In the past, “innovation” referred to any new product. For example when a wooden chair was first introduced, it was considered to be an innovation. However, a massage chair that can be operated with a button (a chair with technical ability) is what this study would consider an example of a “technological innovation.”

Another term that technology has managed to hijack and one that is widely used as its synonym, is the term “Information Technology” or IT. IT is an important component and an example of technology but is not a synonym to it. This study is not only concerned with IT innovations, but with technological innovations in general.

Shane (2005) defines the term technology as “the embodiment of knowledge in ways that make it possible to create new products, exploit new markets, use new ways of organizing, incorporate raw materials, or use new processes to meet customer needs” (Shane, 2005). A technological enterprise involves the application of “scientific

knowledge” in the creation of a product. It is important to note that the first step in evaluating the success of a technological enterprise should be the evaluation of the elements that may predict the success of a “technical innovation.”

Can we identify elements that may predict the success of a technology? There have been many attempts to determine the technical feasibility of projects. Institutions that fund scientific projects such as The National Science Foundation (NSF), the Small Business Innovation Research (SBIR) follow criteria that help them in trying to evaluate proposals based on technical merits.

The list of the Fortune 500 companies contains many technology related companies. Scott Shane believes that “the venture capitalists that finance firms, almost always focus on high technology businesses because they know that the odds of success are best with these kinds of companies.” He added that venture capitalists “also know that the number one predictor of new business failures is the industry in which the firm is founded” (Shane, 2005).

The Technology Acceptance Model (TAM) was developed by Fred Davis to explain computer usage behavior. TAM is based on Fishbein and Ajzen’s Theory of Reason Action (TRA). TAM uses TRA as a basis for accounting for two key sets of: perceived usefulness and perceived ease of use (Malhotra and Galletta 1999). Bagozzi, et al. (1992) mention that since “new technologies such as personal computers are complex

and an element of uncertainty exists in the minds of decision makers with respect to the successful adoption of them, people form attitudes and intentions toward trying to learn to use the new technology prior to initiating efforts directed at using” (Bagozzi, et al. 1992).

Since the technical industry is a fruitful one, venture capitalists find it appealing for business ventures; however, venture capitalists must be aware that the technology industry is one that differs from a traditional business. Similarly, the models for the technology-based business differ from those for traditional businesses. Part of evaluating a technical product involves the evaluation of the long-term investment to that product. It is expensive to change the brand of the product in which you have invested a lot of money. For example, it is cheaper to buy an upgrade package to existing software than it is to buy new software. Changing technical products is very different from buying a new detergent for clothes. Buying a Sony laptop may affect one’s decision later when buying a digital camera. It will be easier to use the camera and download pictures and videos onto the laptop without using any additional software and wires. “*Lock-ins*” or committing people to brands occurs more frequently in technology than in other industries.

Schoemaker and Day (2000) said that “assessments of markets for new technologies are further complicated by the interaction between technological development and the rate of market.” It is a market full of uncertainties and guided by the

three concepts: 1. diffusion and adoption; 2. exploration and learning; and 3. triangulation for insights (Schoemaker and Day, 2000). Moreover, bringing those products successfully to market would mean the life of those ventures. In 1991, 90% of the 16,000 new products that were introduced did not reach their business objectives (Balachandra and Friar 1997).

Adoption is one of the most critical issues that face new technological innovations in today's market. It becomes even more of a challenge when this new innovation demands a "switch to a new infrastructure paradigm" (Moore, 1995) such as the shift from typewriters to the use of computers for word processing. The main theories of the adoption of new technologies are presented by Moore (1991), Roger (1995) and by Schoemaker and Day (2000). All of these theories are based on the Technology Adoption Life Cycle introduced by social research in the late 1950's.

The rate of adoption is slower for technical products. Foster (1986) states that "technology advances slowly at first, then accelerates, and then inevitably declines." In "Inside the Tornado", and "Crossing the Chasm", Moore (1991, 1995) discusses the Technology Adoption Life Cycle, a bell curve model that outlines how technology adoption differs in its lifecycle from other products. The first people to embrace the technology are called "Technology Enthusiasts", next come the "Visionaries" followed by the "Pragmatics", then the "Conservatives", and lastly, the "Skeptics".

Agreeing with Moore, Roger (1995) in his book “Diffusion of Innovation” discusses a model in which he views clusters of people as adopters of new concepts within a life of an innovation. Roger’s model is very similar to the Technology Adoption Life Cycle discussed by Moore. Roger categorized technology adopters into five groups: the innovators, early adopters, early majority, late majority and laggards (Roger, 1995) Figure 2-4 shows Moore and Roger’s basic technology adoption curve in terms of time and percentage of adopters of the new technology.

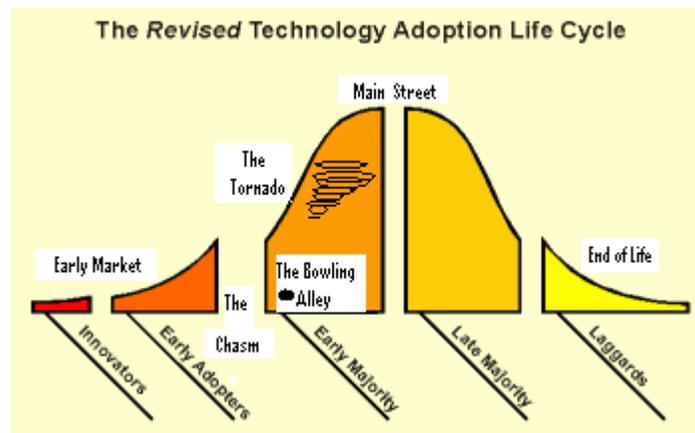


FIGURE 2-4: Revised Technology Adoption Life Cycle (Moore, 1995)

Galbraith, et al. (2006) have investigated a set of factors related to the future success of technology. They based their models on organizational and technological factors. They believed that it is important to test technical merits of the product together with the organizational aspects because both the industry and the market play an important role in the success of a technology. They also questioned whether “expert evaluators can [a priori] provide useful information during the technology review

process.” (Galbraith, et al. 2006). The organizational variables that were used in their model were the following: technology category, previous funding, partnership and alliances, number of employees, highest degree, diversification of technology, and technology development stage.

The technological factors focused on the ‘technical merit’ or ‘commercial potential’ of the technological innovation. Galbraith, et. al. (2006) found that little is understood about the predictive capabilities. They questioned the ability (insight, foresight, or skills) of the person evaluating the technology. The technology variables that are based on expert reviewers were: reasonableness, technical merit, commercial potential, competitive advantage, and team ability. They showed that all of the organizational factors contributed significantly to technology success. On the other hand, the technology factors - the expert assessment analysis - showed no significance to the values used except for the ‘team ability’ variable, which characterized the technical ability of the team. So a reasonable conclusion was that a good predictive model may be developed based on organizational and technical ability.

#### **2.2.2.2 Technical Entrepreneur**

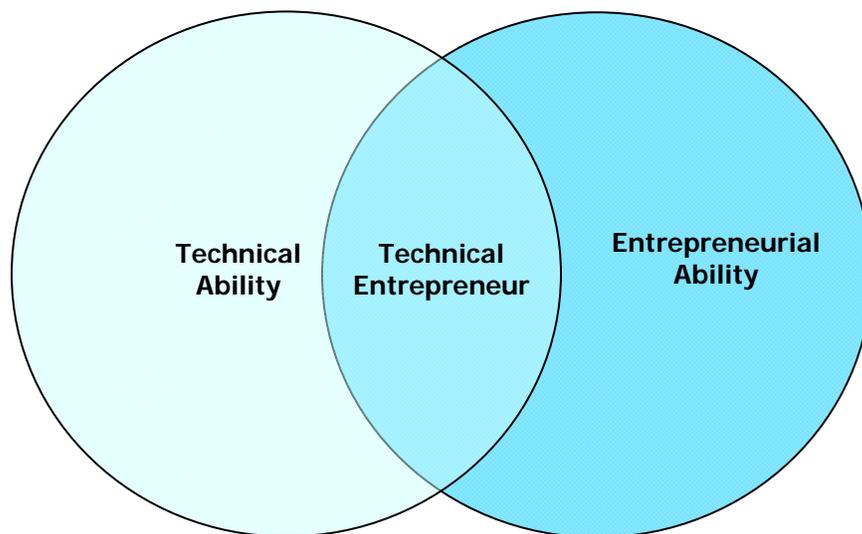
Many researchers today are trying to define traits and characteristics of a successful entrepreneur (Litval and Maule 1976; Chu 2004; Oakey 2003). When we think of successful technical entrepreneurs, we think of people such as Bill Gates of

Microsoft Corporation, Michael Dell of Dell Inc, Lawrence J. Ellison of Oracle, and Steve Jobs of Apple Computer, Inc. Why did they succeed in technical entrepreneurship?

Their success can be attributed to both their advanced skills in technology and their great entrepreneurial skills. Their technical background enabled them to devise innovative products that created a great public demand and their entrepreneurial skills enabled them to build and maintain their empires. Technical entrepreneurs serve as the interface between the technical innovations (products and services) and the business (markets and organizations). Without the technical entrepreneur, there would be no communication and/or understanding between the market and the technology.

Generally speaking, technical ability and entrepreneurial skills can both be achieved to a limited degree. An entrepreneur with a great drive and motivation could seek out the technical skills needed to create a successful technical business. At the same time, a person with technical ability could seek out the entrepreneurial skills needed to create a successful business. It is this blend of both skills in an individual that can bring about success in technological enterprises. People who are interested in becoming entrepreneurs should examine their entrepreneurial skills and fine tune their skills by putting them into action to achieve their goals. However, if a technical person cannot attain entrepreneurial abilities despite an effort to do so or if an entrepreneur cannot learn technical skills, this does not necessarily mean that success cannot be achieved. It only means that this individual cannot be considered a technical entrepreneur. It also does not

mean that technical entrepreneurship is beyond their reach; a person with technical skills could team up with a person with entrepreneurial skills and together they could create a successful technical enterprise. Figure 2-5, below, defines the “Technical Entrepreneur” as one with both technical skills and entrepreneurial skills.



**FIGURE 2-5: The Technical Entrepreneur**

The same model applies to either an individual (technical entrepreneur) or a team of people with a blend of technical ability and entrepreneurial skills. For an individual, each circle represents his/her technical ability blended with his/her entrepreneurial ability. For a team, this model represents various people with various abilities. For example, one circle can represent one person with a technical ability while the other circle represents someone with entrepreneurial skills. The overlap of the two circles is a major ingredient of the recipe for technical entrepreneurship success. So a technological

entrepreneur, “a hybrid of scientist/engineer and business person”(Phan and Der Foo 2004), is paramount in a technological enterprise.

One can reasonably say that a scientist or an engineer is a technical person. But how do we assess if these scientists and engineers also have the entrepreneurial skills vital to begin and maintain a successful technical enterprise? If the entrepreneur is a factor of success within a technological enterprise, then a closer look into the entrepreneurial ability of these scientists and engineers becomes paramount. Bankman and Gilson (1999) stated that it was important for us to assess the character of the person applying for a start-up. They specifically wrote that “assessment of the entrepreneur is critical to the venture capitalist’s valuation” (Bankman and Gilson 1999).

In a newsletter of the Women Entrepreneurs in Science and Technology, Inc., John Chu questions the critical characteristics that led to the success of most of the scientist entrepreneurs. He believed that the entrepreneurial traits were more art than science and required a mind and personality that may be “more Picasso than Thomas Edison” (Chu, 2004). Even though he felt that the traits that a scientist exhibits such as inquisitiveness, flexibility, openness to new concepts, problem-solving skill ability and mathematical ability may enable a scientist to comprehend budgeting, financing, and projection matters, he felt that this was not sufficient for developing a successful business, since entrepreneurs have another set of skills that lean more towards art than science (Chu, 2004).

Personality theories have been the interest of many researchers. Bridge, et al. (2003) discuss that while most of the successful entrepreneurs owe their success to their “innate entrepreneurial abilities” as opposed to the ones that have been learned, that does not mean that improving skills will be a waste of time. They reiterate that in personality theories the “simplest theory suggests that it is the possession by individuals of a trait or traits that predisposes them to enterprising behavior” (Bridge, et al. 2003).

Buttner and Gyskiewicz (1993) discussed the importance of identifying the traits that make a successful business initiator. Moreover they stressed the need to find out how these individuals “survive the early years of a risky venture start-up” (Buttner and Gyskiewicz, 1993). They proposed that the different traits of entrepreneurs can help to predict whether or not they will remain in the business or cash in for a quick profit. Their study used Kirton's Adaption-Innovation (KAI) instrument to study the entrepreneur's style in problem solving. The basic notion of the Adaption-Innovation Theory, as developed by Michael Kirton, is that problem-solving style operates as a personality dimension. A person may either be on the adaptive side or the innovative side. Buttner and Gyskiewicz were interested in taking a closer look at the entrepreneurs that had an adaptive style and others that had an innovative style. They concluded that highly innovative entrepreneurs started more ventures than the adaptive ones, but adaptive entrepreneurs operate businesses over a longer period of time (Buttner and Gyskiewicz, 1993).

### **2.2.2.2.1 Myers-Briggs® Type Indicator (MBTI®)**

Katherine Briggs and Isabel Myers began work on an instrument to assess the personality traits and characteristics of certain personality types. This instrument, The Myers Briggs Type Indicator (MBTI), was an extension of Jung's Theory of Psychological Types (Leonard and Straus 1998). The MBTI uses four pairs of attributes resulting in a total of 16 personality types. The four attributes as summarized by Culp and Smith (2005) are:

- Extroversion (E) vs. Introversion (I): This deals with orientation – it is how people prefer to focus their attention inward to themselves or outward to other people as a source of energy.
- Sensing (S) vs. Intuition (N): This is a perception function - it is the way an individual takes in information and views the world.
- Thinking (T) vs. Feeling (F): This is related to judgment- it is the way an individual prefers to make decisions.
- Perception (P) vs. Judgment (J): This is about how an individual arrives at conclusions.

Leonard and Straus (1998) believed that personality type exams may be used as a helpful tool for highlighting the traits of a person. Today Psychometric testing is “used by over 80% of the Fortune 500 companies in the USA and by over 75% of the Times Top 100 companies in the United Kingdom (UK). Information technology companies,

financial institutions, management consultancies, local authorities and the civil service all make extensive use of use psychometric testing.”<sup>9</sup> What started as an instrument used by psychologists to identify certain traits of people, is now used by business leaders as tools to help study team dynamics and educational institutions to help students with their career paths. Personality testing was \$450 million industry in 2007 and is expanding by about 10% per year<sup>10</sup>. Figure 2-6 lists the 16 personality types comprised of the different combinations of the four MBTI personality traits.

ENTP	ESTP	INTP	ISTP
ENFP	ESFP	INFP	ISFP
ENTJ	ESTJ	INTJ	ISTJ
ENFJ	ESFJ	INFJ	ISFJ

**FIGURE 2-6: The 16 Personality Types of the MBTI**

MBTI may be a good indicator of entrepreneurial skills. Using the MBTI, “[e]ntrepreneurs are most often profiled as ENTP. They have an external (extrovert) orientation, E; are innovative or intuitive, N; are responsive to change and ideas, T; and are perceptive, P” (Dorf and Beyers, 2005). The 16 personality types (listed in Figure 2-5) are associated with compatible career paths which include entrepreneurship. A study performed by Jarlstrom (2000) used personality characteristics to explain career choice. It studied each attribute and focused on the strengths such as technical and managerial competence.

<sup>9</sup> <<http://www.businessballs.com>> 23 April 2008

<sup>10</sup> Ibid

### **2.2.2.3 Business Concept (business plan)**

Technological innovations may bring about the birth of new enterprises. Oftentimes, technical enterprises begin with a technical entrepreneur's vision. A business plan is "a written expression of the entrepreneur's vision for converting ideas into a profitable, going business" (Baron and Shane 2005). A more explicit definition of a business plan is a "document that describes the opportunity, product, context, strategy, team, required resources, financial return, and harvest of a business venture" (Dorf and Bayer 2005).

A business plan serves as the foundation of an enterprise. The importance of a well developed business plan cannot be underestimated because it is the business plan that is essential for procuring funding for the venture. Ginn and Sexton (1990) claim that business plans are "necessary for attracting debt or equity financing in addition to providing evidence of growth planning, serving as a vehicle for communication of growth objectives, and providing milestones of performance against which results can be measured." A well written business plan can provide unlimited benefits (Arkebauer 1995) including:

- Modeling the company on paper may allow identifying potential problems and have a contingency plan before problems even occur (O'Connor, 1998).
- It may reduce failure (Crawford-Lucas, 1992).

- Serves as a funding solicitation tool (I2V-UCF, 2007).
- Shows organized information about the company for outside parties (Hodges, 1997).

Funding institutions such as venture capitalists, angle investors, banks, and government institutions require a business plan from potential entrepreneurs. According to Michael Chriswell, president and founder of Revelation Training, “the first marketing function for all persons that are looking for funding is your business plan” (I2V-UCF, 2007). After an initial assessment of the business plan, the funding institution conducts an evaluation study. An entrepreneur will be funded if the results of the evaluation study are favorable. Finding good predictors of success in the business plan has challenged scholars for many years and continues to serve as an elusive goal for funding institutions and investors.

Wells (1974), Poindexter (1979) and Tyebjee and Bruno (1984) have evaluated characteristics that were important to venture capitalists’ assessments of an enterprise as shown in Table 2-4. Tyebjee and Bruno (1984) also used 23 evaluation items significant to the assessment of a venture as shown in Table 2-5.

**TABLE 2-4: Venture Evaluation Criteria (Tyebee and Bruno, (1984))**

<b>Wells (1974)</b>	<b>Poindexter (1976)</b>	<b>Tyebee &amp; Bruno (Study 1)</b>
<b>Sample: Eight Venture Capital Firms, personal interviews</b>	<b>Sample: 97 Venture Capital Firms, mailed questionnaires</b>	<b>Sample: 46 Venture Capitalists, telephone survey, open ended questions</b>
<b>Factor</b>	<b>Investment Criteria by Rank Order of Importance</b>	<b>Factor</b>
Management Commitment	1. Quality of Management	1..Management Skills and History
Product	2. Expected Rate of Return	2. Market Size/ Growth
Marketing	3. Expected Risk	3. Rate of Return
Marketing Skills	4. Percentage Equity Share of Venture	4. Market Niche/Position
Engineering Skills	5. Financial Provisions for investor Rights	5. Financial History
Marketing Plan	6. Venture Development Stage	6. Venture Location
Financial Skills	7. Interest or Dividend Rate	7. Growth Potential
Manufacturing Skills	8. Percent Capitalization	8. Barriers to Entry
References	9. Investor Control	9. Size of Investment
Other participants in Deal	10. Tax Shelter Consideration	10. Market/Industry Expertise
Industry/Technology		11. Venture Stage
Cash out Method		12. Stake of Entrepreneur

**TABLE 2-5: 23 Evaluation variables (Tyebee and Bruno 1984)**

<b>Evaluation Criteria</b>	
1. Management Skills	13. Size of Market
2. Marketing Skills	14. Growth Potential of Market
3. Financial Skills	15. Freedom from Regulation
4. References of Entrepreneur	16. Protection from Competitive Entry
5. Technical Skills	17. Resistance to Economic Cycles
6. Profit Margins	18. Protection of Obsolescence
7. Uniqueness of Product	19. Protection of against Down-side risk
8. Patentability of Product	20. Opportunities of exit
9. Raw Material Availability	21. Merger/Acquisition Potential
10. Production Capability	22. Hedge Against Current Investment
11. Access to Market	23. Tax Benefit
12. Market Need for Product	

### **2.2.2.3.1 Important elements of any business plan**

Sahlman (1997) highlighted four main categories that one must address in a business plan: the people, the opportunity, the context, and the risk and rewards.

- The people: are the person/persons that are starting and leading the business. This also includes personnel such as lawyers, accountants and all individuals that are playing a key role in the running of this venture.
- The opportunity: in this section the product or service is highlighted. A discussion of the venture's growth is presented. It also discusses the potential customers for this product or service. It includes the potential competition.
- The contest: this includes a presentation of the environment that this business falls in. It presents some factors that may effect the business, but over which the owners have no control such as government policy and regulations.
- Risk and Reward: a list of scenarios of everything that may take place and affect the business positively or negatively and how the team will react/respond to the situation.

Hormozi, et al. (2002) also highlighted the important elements of a business plan. They divided the business plan into the following five sections: introductory elements, the business section, financial statements, appendix of a business plan, and additional information for the investor.

- The introductory elements: this section includes the *cover page*- which provides the reader with the name of the business, name of the person submitting the business plan and all contact information, *table of content* – which provides the reader with a quick way to locate the different sections of a business plan, and the *executive summary* – which informs the reader of what they are about to read.
- The business section: this section should provide the reader with the industry, the company overview, product or service, pricing, the market, the marketing plan, and the management team.
- The Financial Statement: it provides the reader with all financial projections such as – income statement, balance sheet, statement of cash flow.
- The appendix of a business plan: data in this section includes research data, additional financial information, diagrams and figures.
- Additional information for investors: this section would include risks and harvests associated with the investments.

### **2.3 Evaluation Techniques**

From the previous sections it is clear that there have been many attempts to identify important factors for success of a business venture in general and a technological venture in particular. This section will focus on the different methods and different processes that have been followed in different funding institution to approve a business plan for funding, which this study refers to as an early stage success.

### **2.3.1 Technology Incubators**

According to Girmaldi and Grandi (2005) “The Incubation concept seeks an effective means to link technology, capital and know-how in order to leverage entrepreneurial talent.” They identified four different types of incubators: Business Innovation Centers (BICs), University Business Incubations (UBIs), Independent Private Incubators (IPIs), and Corporate Private Centers. These organizations take new ventures that show “promise” and provide resources and services to help guide them in the early stages.

### **2.3.2 Business Plan Competitions**

Business plan competitions can be traced back to the 1980’s. In 1984 two MBA students from the University of Texas at Austin wanted to have a school activity that was similar to the prestigious Moot Court activity at the Law Department. That was the birth of the prestigious Moot Corp Competition at the University of Texas. Today the Moot Corp business plan competition is an annual, global event, in which over 40 universities participate. It is the gold standard for business plan competitions.

Business plan competitions held in universities can serve as “mechanisms providing the opportunity to find, select and stimulate promising ideas from young students and graduates” (Grimaldi and Grandi 2005). Today, as shown in Appendix A, many universities, entrepreneurship centers, NGOs, and technology parks hold business

plan competitions to assist entrepreneurs with business ideas that are looking for funding. Those business plan competitions can act as hubs that would bring together individuals with ideas and those involved with start-ups such as angel investors, venture capitalists, serial entrepreneurs and professionals such as bankers, lawyers, accountant's network to discover and exploit business ideas (Huffman and Quigley 2002).

Each business plan competition has its unique process. The two things they have in common are contestants and evaluators. These competitions follow a process where the applicants submit an executive summary for their innovative idea, then develop a business plan. These executive summaries go through an evaluation process by the evaluators and a number of these summaries will be rejected. The accepted ones will go on and submit a full business plan. These business plans also go through a process of evaluation. Finally, a number of finalists are selected and those will present their idea and business plan to a panel of judges and in turn the judges will select the best idea. Business plan competitions have many phases and steps and the lucky winners may get funded and conclude with a start-up. Figure 2-6 illustrates the phases in a business plan competition.



**FIGURE 2-7: Phases of Business Plan Competition (Dodt, Stein, and Strack 1999)**

In the past, students might have used an internship to gain experience and obtain a job upon graduation. Similarly, recruiters and firms provide scholarships to students with outstanding records in order to have them work for them once they are done. Today, universities use business plan competitions to link entrepreneurial students to sources of funding, to give them valuable experience, and guidance and to help them develop their own employment (Huffman and Quigley 2002).

## **2.4 Summary of Findings**

As shown in the literature review, considerable research has been conducted on the topic of technical entrepreneurship. Over 100 characteristics and factors that contribute to success have been identified for various technology sectors by a variety of researchers. Three primary indicators of success are cited in many of the works: the technical innovation, the personal traits of the entrepreneur, and the soundness of the business plan. Similarly, the mechanisms that currently evaluate new start ups (Incubators, Business Plan Competitions, and Venture Capitalists) were presented. These mechanisms have one thing in common. They must each be able to evaluate the success without the assistance of a crystal ball. The literature failed to identify a model that has universal acceptance in the evaluation of new technical ventures.

## **Chapter 3: Research Methodology**

This chapter details the approach that was followed in the study of technical entrepreneurship. It defines the scope of the problem, suggests a research hypothesis, and poses appropriate research questions. The approach that was followed in the development of the entrepreneurial model, including a discussion of the basic form of the model, is included. Methods used to identify and solicit participants are described. The instruments developed in support of the data collection (survey forms and questionnaires) and data interpretation/normalization efforts are presented. Finally, the methods used in the validation of the model are discussed.

### **3.1 Problem Statement**

There are many factors that contribute to the success of technology based business ventures at the early funding stage. As presented in the literature review, no research to date has investigated the correlation of the innovative technology, the business plan and the personality of the entrepreneur with the success of technological enterprises at the early stage of. Further, a model for predicting success in technical enterprise start-ups is not available. Although tens of thousands of new technical start-ups are evaluated each

year, a preferred methodology for performing the evaluation is not available. My research attempts to answer the question:

*Can a model be developed that improves upon the review process and provides insight into the rating of new technology ventures?*

### **3.2 Aim of Research**

My research aims to determine the relationship between the technical innovation, the business plan, the personality of the technical entrepreneur and the ranking of the startup in a business plan competition. I further aim to determine the significance of the various factors in a statistical model through the use of multiple linear regression analysis.

### **3.3 Research Hypothesis**

*The ranking of a technical start-up can be estimated based on the value of three factors: the technological innovation, the business plan and the personality of the technical entrepreneur.*

**H<sub>1</sub>** The merit of the technical product or service is significantly correlated with the early success of the technological enterprise (Hypothesis – H<sub>1</sub>)

**H<sub>2</sub>** The merit of the business plan is significantly correlated with the early success of the technological enterprise (Hypothesis - H<sub>2</sub>)

**H<sub>3</sub>** The personality type of the technical entrepreneur is significantly correlated with the early success of the technological enterprise (Hypothesis – H<sub>3</sub>)

### **3.4 Research Questions**

Based on the research framework the following research questions were developed:

1. Can the success of a technological start-up be modeled?
2. How can the model be used as a tool for the evaluation of a new technological enterprise?
3. What personality criteria contribute to the success of a new technical venture?
4. What is the dominant contributor for a successful enterprise: the technical entrepreneur, business plan, or the technological innovation?
5. What are the main factors that lead to early funding of a technological enterprise?

### **3.5 Research Approach**

The literature review produced many factors that may contribute to the success of a new technical enterprise. In the development of the model these factors were reviewed

and synthesized in an effort to develop a multi-criteria analysis to develop a multi-criteria model. Individuals involved in the development and administration of technical business plan competitions were interviewed. Based on the results of the literature search and interviews, a basic form of the entrepreneurial model was developed. Data for new technical ventures were identified and collected. The data were analyzed and significant factors were identified. A separate set of data were collected from which to validate the model. Details regarding this approach are articulated in the following sections.

### **3.5.1 Development of Model Criteria**

There are many factors that may contribute to the success of a new technical venture. The results of literature review detailed in Chapter 2 identified over 100 elements that may play a role in the business evaluation process. For example, Lussier and Corman (1995) investigated 15 variables. Tyebjee and Bruno (1984) studied 23 items and their contribution to the success of new ventures. Bürdel et al. (1992) investigated factors that they believe effect the success of a newly launched business. Roure and Keeley (1990) studied elements that may lead to the prediction of success in new technology-based businesses. Other studies by Davis and Zweig (2005) showed that there are a number of basic components of success for any start-up in general and an IT start-up in particular. Table 3-1 summarizes the elements identified through the review of literature and their source.

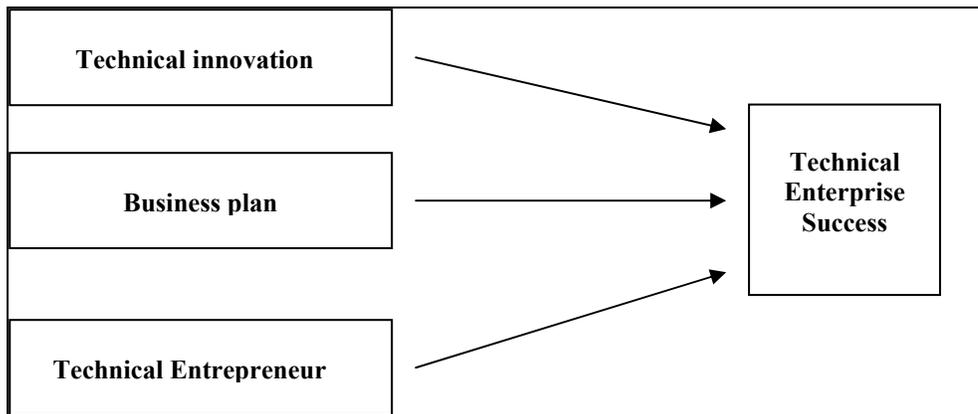
**Table 3-1. Technical Venture Success Factors**

<b>Name of Authors</b>	<b>Elements</b>
Brudel, Preisendorfer, and Zigler (1992)	<p><b><i>Human Capital:</i></b>            Years of schooling            Years of work experience            Industry specific experience            Self-employment experience            Leadership experience            Self-employment of father</p> <p><b><i>Organizational Characteristics</i></b>            Newness            Initial size            Organizational strategies</p> <p><b><i>Environmental conditions</i></b>            Location            Branch of industry            Market condition</p>
Davis and Zweig (2005)	Market Appropriate product or service Financial resources Solid management team
Roure and Keeley (1990)	Management Venture strategy Competitive environment
Lussier and Corman (1995)	Capital Record Keeping and Financial Control Industry Experience Management Experience Planning Professional Advisors Education Staffing Produce and Service Timing Economic Timing Age Parents Minority Marketing
Shepherd (1999)	Stability Timing of Entry Lead Time Competitive Rivalry

Name of Authors	Elements
	Educational Capability Industry Related Competence
Wells (1974)	Management Commitment Product Marketing Skills: Marketing, Engineering, Financial, Manufacturing Marketing Plan References Other Participants in Deal Cash Out Method
Pointdexter (1976)	Quality of Management Expected rate of return Expected Risk Percentage Equity Share of Venture Financial Provisions for Investor Rights Venture Development Rate Percent Capitalization Investor Control Tax Shelter Consideration
Tyebjee and Bruno (1984)	Skills: Management , Marketing, Financial, Technical References of the entrepreneur Profit Margins Uniqueness of Product Patentability of Product Raw Material Availability Access to Market Market need for Product Size of Market Growth Potential of Market Freedom from Regulation Protection from Competitive Entry Resistance to Economic Cycles Protection of Obsolescence Protection against down-side risk Opportunities of Exit Merger/Acquisition Potential Hedge Against Current Investment Tax Benefit

Although the factors that contribute to success were abundant, three primary indicators of success appeared consistently throughout the literature: the technical

innovation, the business concept, and the characteristics of the founder. These indicators represent broad categories of factors that relate to success. However, their combined impact was not evaluated. My review suggested the need for a study on the synergistic effects of the three primary indicators, resulting in a simple model.



**FIGURE 3-1: Elements of technological enterprise success.**

### **3.5.2 Interviews and Observations**

To gain a better appreciation for the technical entrepreneurship evaluation process, interviews were conducted with venture capitalists, business plan competition administrators and evaluators, incubator managers, and entrepreneurs. The objectives of the interviews were:

1. To understand how new venture proposals are evaluated,
2. To determine the important elements in the evaluation process,
3. To understand how the important factors were measured and weighted,

4. To understand the difference between technical and non-technical venture evaluations,
5. To identify what data were stored following the review process,
6. To determine whether the organization would be interested in using an entrepreneurial model to help evaluate technical start-ups, and
7. To collect potential evaluation forms.

The organizations selected for the interview and data collection process were identified through an internet search (See Appendix A), professional organization referrals, and conference attendance<sup>11</sup>. The organizations can be broadly separated into three classes: (1) institutions that provided information about technical business plan evaluations, (2) institutions that provided data used in the development of the model, and (3) institutions that provided data used in the model validation. Table 3-2 lists the organizations that participated in my study and identifies the role that each played in the research effort. The reader is directed to Chapter 4 for details regarding the data collected for each institution.

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<sup>11</sup> Invention to Venture workshops in technology entrepreneurship – University of Central Florida, Orlando, Fl. November 9<sup>th</sup> 2007.

Technology Start-Up Boot Camp – MTECH – Maryland Technology Enterprise Institute -University of Maryland, College Park, October 19<sup>th</sup> 2007

### **3.5.3 Evaluating “Evaluation Forms”**

The interviews and observations provided a better understanding of the methodology that is used by each institution to evaluate new technical businesses. Many of the business plan competitions used an evaluation tool (generally a form) that summarized the strengths and weaknesses of each new enterprise. The forms also show the weightings used in the evaluation process: implied by the maximum number of points that could potentially be allocated for the factor in question. The following forms are included in Appendix B:

- FedEx Institute of Technology Business Plan Competition Evaluation Form
- Technology Entrepreneurship Center Business Plan Evaluation Form
- WPI Venture Forum Business Plan Evaluation Form
- MOOT CORP Business Plan Evaluation Form
- Sunshine State Venture Challenge Business Plan Evaluation Form
- TiEQuest Business Plan Competition Evaluation Form

An internet review of judging criteria used in technical business plan competitions revealed that the values listed in Figure 3-2 are commonly used. Each criterion is evaluated on a Likert Scale (1-5) which is the most widely used scale in survey research. The original data collection plan called for the exclusive use of the form shown in Figure 3-2. Many of the business plan competitions had already been conducted for the year.

Therefore, data were collected using the instrument of choice for the institution. Each institution that participated in the study was asked to classify each of their evaluation criteria as either technology related or business related. The advantage of this data collection approach was that the process used by each institution was unchanged. The model that was ultimately developed was able to accommodate data collected using a variety of forms.

**TABLE 3-2: Data Sources**

<b>Institution</b>	<b>Technical ventures and business plans evaluation process</b>	<b>Data used in model development</b>	<b>Data used in model validation</b>
Industrial Bank of Kuwait (IBK)	√		
Kuwait Small Project Development Company (KSPDC)	√		
Technical Entrepreneurship Center (TEC) – Kuwait	√	√	
Knowledge Oasis Muscat (KOM) -- Oman	√		
Mercury Technology Labs – Memphis - Tennessee – USA	√	√	
iPark – Jordan	√		
Worcester Polytechnic Institute (WPI) – Massachusetts – USA	√		
FedEx Institute of Technology – Memphis – Tennessee		√	
Sunshine State Venture Challenge – University of Central Florida		√	
MOOT CORP University of Texas at Austin		√	
TiEQuest Business plan competition – Canada			√

The business plan evaluation sheets for each institution provided the basis for the data normalization. The numerical scores for the technical value and business value of each proposal were developed as a proportion of the maximum points allocated for these two indicators of success. The values were compiled based on the institutions' classification of business or technical criteria. No attempt was made to standardize the elements selected for both the technical value and business value; rather the aim was to use each institutions' criteria without modification. For example, if an institution were to consider the *Product and Service*, *Operation Strategies* and *Innovation* as "technical", then the normalized sum of these scores would represent the Technical Value in the entrepreneurial model.

$$\textit{Technical Value} = \textit{Product \& Service} + \textit{Operation Strategies} + \textit{Innovation}$$

Similarly, the scores for *Income Statement* and *Management Team* might comprise the Business Value. This process of calculating the technical value and business value was repeated for every participating institution based on their unique set of criteria and the institution's designation of technical and business factors.

Please evaluate the written business plan based on the following criteria: 1 = Poor 2 = Fair 3 = Adequate 4 = Good 5 = Excellent						Comments/ Questions
1. <b>Executive summary</b> - clear, exciting, and effective as a stand-alone overview of the plan; includes brief description of each succeeding section of the plan; can be read in 5 minutes	1	2	3	4	5	
2. <b>Company Overview</b> - presents a vision, history, current status, strategy, goals, mission and objectives for the business	1	2	3	4	5	
3. <b>Products or Services</b> - describes the key features and benefits, current stage of development, proprietary position, and competitive advantages of the product or service	1	2	3	4	5	
4. <b>Market Analysis</b> - presents the growth trends and key driving forces of the industry; identifies the key characteristics and needs of the target market(s); assesses the competitive environment; demonstrates market acceptance for the product or service	1	2	3	4	5	
5. <b>Management Team</b> - backgrounds and roles of key individuals; history and ability to work as an effective team; personnel needs; organizational structure	1	2	3	4	5	
6. <b>Operating Strategies</b> - addresses the marketing, production, R&D, personnel, administrative, and financial strategies for the proposed firm	1	2	3	4	5	
7. <b>Critical Risks</b> - Realistically identifies the major internal and external critical risks that could threaten the business and presents viable contingency plans to address these issues	1	2	3	4	5	
8. <b>Cash Flow Statement</b> - presents a realistic assessment of cash requirements –inflows and outflows-- over a projected 5-year period; cash flows are consistent with operating and marketing strategies outlined in the body of the plan; cash flow information is detailed for first 2 years, quarterly/annually for years 3-5	1	2	3	4	5	
9. <b>Income Statement</b> - demonstrates realistic and attractive income potential of the business; the income statement is consistent with the operating and marketing strategies outlined in the body of the plan; income statement information is detailed for first 2 years, quarterly/annually for years 3-5	1	2	3	4	5	
10. <b>Balance Sheet</b> - presents a realistic assessment of the working capital and fixed asset requirements of the business; appropriately reflects the projected capital structure of the business -- long term debt and equity positions; balance sheet information is projected annually for 5 years	1	2	3	4	5	
11. <b>Funds Required/Used</b> - clear and concise presentation of amount, timing, type and use of funds required for venture	1	2	3	4	5	
12. <b>Offering</b> - clearly articulates the proposal/terms to investors; identifies what entrepreneur is seeking from investors; states how much equity will be given up in return for investment capital; presents a realistic assessment of ROI potential; presents an appropriate deal structure and possible exit scenarios	1	2	3	4	5	
13. <b>Innovation</b> – uniqueness, value, competitors, product performance, product obsolescence, number of distributors, customers switching cost	1	2	3	4	5	

**FIGURE 3-2: Sample Evaluation Sheet**<sup>12</sup>

<sup>12</sup> Modified from <http://www.nebusinessplancompetition.com/criteria.pdf> 1 17 Apr. 2008

### 3.5.4 Test Instrument – Jung’s Personality Exam

The third criterion that was used in the development of the entrepreneurial model is a numerical representation of personality type. Based on the results of the literature review of personality type instruments, Jung’s Personality Exam<sup>13</sup> was selected. The test instrument that will be used is based on the efforts of Carl Jung, David Kiersey, Isabel Myers and Katherine Briggs. “They are similar in underlying theory to the Myers-Briggs Type Indicator (MBTI) and the Kiersey Temperament Sorter.”<sup>14</sup>

Devito (1985) states that the MBTI is probably the most widely used instrument in the area of clinical counseling and personality testing. Ginn and Sexton (1990) used the Myers-Briggs Type Indicator to study the personality types of *Inc. 500* founders because “the instrument has almost become the standard for comparative analysis of the psychological types”. The MBTI and Myers-Briggs ®Type Indicator are registered trademarks of the Myers-Briggs Type Indicator Trust. It should be noted that the preferred way to develop the indicator is to take an official Myers-Briggs test from a qualified professional. However, there are many equivalent tests and, though successful, some psychologists feel it is not as foolproof as stated by the developers and Trust. For the purposes of this research, the Internet of Jung’s Personality Exam was used. The Internet version of the exam generates sixteen personality types based on Jung’s four

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<sup>13</sup> "The Jung Test used is similar to the MBTI typology but has no affiliation to the MBTI," <http://www.similarminds.com>

<sup>14</sup> <http://www.similarminds.com> 4 June 2006

dimensions: Extroversion/Introversion, Sensation/Intuition, Thinking/Feeling, and Judging/Perceiving (Keirsey and Bates, 1978). The purpose of this part of my research was to develop an entrepreneurial model as opposed to a personality model. I made no attempt to evaluate participant's personalities or to validate the personality test. Similarly, I did not attempt to validate the technical or business plan scores submitted by the business plan judges. Rather, the Jung's Personality scores were used as independent variables in my model. The decision of significance was left to the statistical results of the research. The decision of whether or not personality traits would be statistically significant to the rankings of business plans was determined through the research. Each entrepreneur took the Internet Test<sup>15</sup> and submitted the numerical percentages of each personality trait.

In examining the Myers-Briggs theory, individuals are profiled into 16 different combinations of either [Extroverted (E) or Introverted (I) ] and [Intuitive (N) or Sensing (S)] and [Thinking (T) or Feeling (F)] and [Judging (J) or Perceiving (P)]. The Myers Briggs Type Indicator or the Jung's Personality Type is a four letter combination such as ESTJ. The reader is referred to Appendix D for further details regarding the personality types. An example of the results for the MBTI is shown in Figure 3-3.

Extroverted (E) 61.11%	Introverted (I) 38.89%
Sensing (S) 53.33%	Intuitive (N) 46.67%
Thinking (T) 70%	Feeling (F) 30%
Judging (J) 61.54%	Perceiving (P) 38.46%

**FIGURE 3-3: Results of Personality Test<sup>16</sup>**

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<sup>16</sup> This sample example was captured using a website that administers Jung's Personality <http://www.similarminds.com> 4 June 2006

Each dominant trait has a value greater than 50 percent. The alternative trait is the compliment of this value (100% minus the dominant trait percentage.) An individual is never completely at one personality extreme. Everyone displays both characteristics in different situations. The percentages were used as an indicator of the personality type for an individual submitting a business plan.

### **3.5.5 Identification of Participating Institutions**

An Internet search produced a large number of institutions that routinely host business plan competitions. Each institution was contacted and invited to participate in the research.<sup>17</sup> A complete listing of the institutions contacted is shown in Appendix A. The objective was to identify business plan competitions or organizations that:

- 1) Used a formal evaluation process to evaluate technical start-ups;
- 2) Kept detailed records of the evaluation in the form of numerical results and rankings; and
- 3) Were willing to supply rankings, technical scores, business scores and personality percentages.

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<sup>17</sup> A sample of the correspondence sent to each institution can be found in Appendix E.

### 3.5.6 Data Analysis

It is important to distinguish between making observations and inference. Many qualitative and quantitative observations about entrepreneurial success have been made as documented in the literature review. My research was the first to assess the contribution of personality type to the success of a new technical venture.

Multiple linear regression analysis was used in analyzing the data. Most of the business plan evaluation strategies observed used a linear multivariate weighted approach to develop the ranking of the business plans. The most highly regarded ones were those that had the maximum score for a variety of linear variables. Although there is no reason to suggest that a linear model would fit the collected data, it was selected as a starting point because it emulated most closely the existing plan evaluation methods. Assuming that each independent variable was statistically significant, the model coefficients represent the implied weighting for each of the criteria (business value, technical value, and personality value). The Statistical Package for the Social Sciences (SPSS)<sup>18</sup> was selected to perform the multivariate analysis.

The correlation between the technical, business, and personality values and business plan rank was determined. Various forms of the multiple linear regression model were developed using the normalized business plan scores and Jung's percentages

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<sup>18</sup> SPSS Graduate Pack 15.0 for Windows. [www.spss.com](http://www.spss.com)

as independent variables and the rankings of the technical start-ups as the dependent variable. The model results were used to predict the results of an on-going business plan competition. The predicted results were compared with the actual results of the competition. A stepwise regression analysis approach was used to ensure that only statistically significant variables were included in the model. The regression line was forced through the origin because a constant did not have meaning in terms of the evaluation. The coefficient of determination or adjusted  $R^2$  was developed for each model. This value represents the proportion of variability in the data set that is accounted for by the independent variables.

Because the study uses data from different evaluations the data were first put onto a commensurate scale and normalized. The sum of the business variable values was divided by the maximum business score to normalize the factor. The business variable was similarly determined. To derive the personality variables, the results of Jung's Personality Type evaluation were normalized in the following three ways:

- Percentages for each of the eight values were expressed as proportions.
- The difference of each parameter (Extroverted/Introverted), (Sensing/Intuitive), (Thinking/Feeling) and (Judging or Perceiving) was measured from 50% and expressed as a positive or negative proportion (divided by 100). For example, a high Extroverted (70%) will be calculated as  $(70-50)/100$  or 0.2 as compared with a low Extrovert (25%) that will be calculated as  $(25-50)/100$  or -0.25.

- Data from Ginn and Sexton (1990) that categorized the 159 founders were normalized as shown in Table 3-3. The value assigned to each personality type (pValue) was calculated as the number of individuals with the given personality type (N) divided by the maximum in a category (23).

**TABLE 3-3: Inc. 500 Founders Distribution by Type (Ginn, Sexton 1990) and The Meyers Briggs Foundation<sup>19</sup>**

ISTJ N=23 Eper=14.47% Pper=11.6% pValue=1.0	ISFJ N=1 Eper=0.63% Pper=13.8% pValue=0.04	INFJ N=1 Eper=0.63% Pper=1.5% pValue=0.04	INTJ N=18 Eper=11.32% Pper=2.1% pValue=0.78
ISTP N=10 Eper=6.29% Pper=5.4% pValue=0.43	ISFP N=3 Eper=1.89% Pper=8.8% pValue=0.13	INFP N=6 Eper=3.77% Pper=4.4% pValue=0.26	INTP N=23 Eper=14.47% Pper=3.3% pValue=1.0
ESTP N=9 Eper=5.66% Pper=4.3% pValue=0.39	ESFP N=2 Eper=1.26% Pper=8.5% pValue=0.08	ENFP N=2 Eper=1.26% Pper=8.1% pValue=0.08	ENTP N=18 Eper=11.32% Pper=3.2% pValue=0.78
ESTJ N=15 Eper=9.43% Pper=8.7% pValue=0.65	ESFJ N=1 Eper=0.63% Pper=12.3% pValue=0.04	ENFJ N=5 Eper=3.14% Pper=2.5% pValue=0.22	ENTJ N=22 Eper=13.84% Pper=1.8% pValue=0.95

It is interesting to note, that the entrepreneurial personalities (Eper) are different than the corresponding general population MBTI scores (Pper). The NT personality type shows a much higher percentage in entrepreneurs than the general population. Conversely, the SF personality type is expected at a much higher proportion in the

<sup>19</sup> The Myers & Briggs Foundation, [www.myersbriggs.org](http://www.myersbriggs.org)

general population than in the entrepreneurial group. On a statistically significant basis the entrepreneurs are more introverted ( $p=0.10$ ), more intuitive ( $p=0.05$ ), and more thinking-oriented ( $p=0.05$ ) than the general population (Roberts, 1988).

The dependent variable was the evaluation of the judges or the ranking of the business plan. The “plotting position” was used as a normalizing value for the ranking. The plotting position was determined as follows:

$$Plotting\_position = 1 - \frac{rank}{total + 1}$$

Where: “total” equals the number of business plans competing.

It is important to note that using the institution’s business plan evaluation instrument added to the flexibility of the model. If a statistically significant model could be developed using data from a variety of inputs, the model has almost universal appeal and applicability. For this reason, the institutions that agreed to participate were not strongly encouraged to adopt the form shown as Figure 3-2.

## **Chapter 4: Data Collection and Analysis**

This section displays the data that were collected in support of the research effort. The normalized data used in the development of the model are presented. Similarly the data used for the model validation are shown. The multiple linear regression analyses and statistical parameters are presented.

### **4.1 The Search for Data**

In contacting over 130 institutions in the US and abroad including the small business administrations of multiple countries, The National Science Foundation, banking institutions, incubators, colleges and universities it was concluded the original expectation of well kept records regarding the evaluation of new technical enterprises was grossly overestimated. In reality, the number of institutions that maintain a record of the factors used in the assessment of startups is limited. A listing of some of the institutions that were contacted is shown in Appendix A. To determine if an institution make a reasonable candidate for the research the following questions were asked:

1. How many business plan competitions has this institution conducted?
2. What is their process?
3. What do the contestants do?
4. What do the evaluators do?

5. Are there any evaluation sheets that the judges use to evaluate contestants?
6. Does the evaluation take place during an oral deliberation?
7. If they used evaluation sheets, can we get a copy?
8. Do these evaluation sheets have scores?
9. Do they have a list of venture capitalist and evaluators from the past that we would be able to request from them to fill out a short questionnaire?
10. Would we be able to contact previous contestants or applicants from past business plans to obtain personality scores?
11. Can we get help from the center to capture data during their upcoming business plan competition?

There were many reasons that institutions did not participate in the study. One of the most important reasons was that they simply did not keep record of their data. Other institutions declined to participate because they did not want to suggest to their participants that the personality scores contributed to the evaluation. In order to numerically score the business and technical value, evaluation data from previous competitions was needed. Completion of the MBTI assessment by the former participants was also necessary. Business plan competitions that relied exclusively on oral deliberations were of no use. Rice University for example, used an evaluation sheet during the competition for judges but once the competition was over, they shredded the data for privacy reasons.<sup>20</sup> The University of Central Florida was only able to provide

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<sup>20</sup> In a telephone conversation with Rice university Business Plan Competition Coordinator

2007 data because the competition was taking place as data for the research project was being collected. According to the UCF coordinator Dr. Cameron Ford,<sup>21</sup> records from prior competitions had been destroyed because they were stored in the trunk of his car for over a year and took up too much space! Other institutions did not have records because they returned the evaluation sheets to the contestants for feedback and did not keep a copy for their records. The director of Alabama's Launchpad, Mr. Glenn Kinstler, was willing to participate in asking past and present participants of business plan competitions to fill out the questionnaires and take the personality test but was unable to give me the scoring sheets or provide me with numbers as they have pledges to keep those confidential.

Participating institutions that could provide access to the necessary data (technical evaluations, business evaluations, MBTI scores, and rankings) were very limited. Locating organizations for the study that had credible well kept data and were still in contact with their business plan participants proved to be even more challenging. Ultimately the institutions listed in Table 3-2 were selected to supply data for the model development and validation. The following institutions had the necessary data and process and were willing to participate in the development of the entrepreneurial model.

- Technology Entrepreneurship Center (TEC), Kuwait City, Kuwait
- Mercury Technology Labs, Memphis, Tennessee

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<sup>21</sup> Founding Director of the Center of Entrepreneurship and Innovation, University of Central Florida

- FedEx Institute of Technology, Memphis, Tennessee
- Sunshine State Venture Challenge, University of Central Florida, Orlando, Florida
- Moot Corp, University of Texas at Austin, Austin, Texas

The TiEQuest Business Plan Competition in Ontario, Canada provided data for the model validation.

Once the participating institutions were identified, each contacted were contacted via-e-mail. The Human Subject Review Board (HSRB) Consent forms were sent to each institution notifying them of the confidentiality of their data. Correspondence requesting the business and technical data was sent. Included was the Internet link to the Jung's Personality evaluation and instructions on submitting the MBTI data. In some cases, to improve the response rate of the participants, the institutions were asked to distribute the questionnaires to the participants on behalf of the study. In the case of Mercury Labs, they opted to send a blind data set. The names of the participants were not disclosed in this case. In all other cases, the names of the participants were supplied. These have been kept confidential and will be destroyed upon completion of the project in accordance with HSRB requests.

Each business plan competition has its own unique process. What they all have in common is contestants and evaluators. These competitions follow a process where the applicants submit an executive summary for their idea followed by the development of

their business plan. The executive summaries go through an evaluation process by the evaluators. A number of these summaries may be rejected. The accepted ideas evolve into a full business plan. These business plans also go through a process of evaluation. The evaluators are typically comprised of venture capitalists, entrepreneurs, CEOs, and engineers that are capable of understanding the technical merit and business plan that has been prepared. A group of finalists are selected to present their idea to a panel of judges. The judges select the best idea.

Because of the proprietary nature of business plans, a short questionnaire was developed to allow the participant to answer questions about their business plan and their background without revealing any proprietary information. The purpose of this questionnaire was to verify that the business was technology based. Appendix H contains a copy of the sample questionnaire used to verify the technical nature of the business.

#### **4.2 Interviews and Observations Data**

Complete records of the interviews conducted are included as Appendix C for reference. The name of the individual and institution, information regarding the evaluation process, important factors used to screen business plans, and the number of evaluations that have been performed were recorded. This information formed the basis of the review process.

#### 4.2.1 Industrial Bank of Kuwait<sup>22</sup>

The Industrial Bank of Kuwait participated in the study. This was the first institute contacted. Ms. Farah Al-Haroun, a financial analyst and evaluation officer with the Handicraft and Small Enterprise Department was interviewed. An initial talk with Ms. Al-Haroun indicated that the bank evaluates business plans on daily basis. This has been the core of her job for the past six years. She said that the market, financials and the innovation are the most important elements. She expressed interest in using a more structured model for the evaluation of technological business plans. She mentioned that when they receive a technological business plan they usually are reluctant to move forward with it. She indicated that her department does a separate financial and operational feasibility study before they deny or accept a business plan. She felt that assessing technical feasibility is complicated and unpredictable. They prefer non-technological business plans over technological. She also expressed considerable interest in a methodology that would show some indication as to the entrepreneurial ability of the person that is applying for assistance. She mentioned that they do have a feasibility study for the business plans that they evaluated but unfortunately that they do not have any numerical values or scoring mechanisms that they follow.

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<sup>22</sup>< <http://www.ibkuwt.com/>> 12 Jan 2006

#### 4.2.2 Kuwait Small Project Development Company (KSPDC)<sup>23</sup>

The Kuwait Small Project Development Company (KSPDC) was established in 1996 to promote economic growth by financing promising business ventures. One of the main goals of KSPDC is to promote the entrepreneurial spirit amongst Kuwaiti Nationals in the fields of industrial, handicraft, service and commercial business ventures.

Mr. Faowzi Al-Mani, the Head of the Evaluation Department was interviewed. Mr. Al-Mani has over 10 years of professional experience in the field of investment. His insight provided guidance on the evaluation and monitoring programs at KSPDC. Mr. Al-Mani provided an Internet link that contained the rules and regulations for requesting funding for a business venture. Mr. Al-Mani thought that “the entrepreneurial ability should be considered when approving a business loan.” When further asked if he would be interested in providing a test that would be able to indicate the entrepreneurial ability of a person he was very excited and mentioned that this would be very helpful.

KSPDC currently refers all the technological business plans and ideas to the National Technology Enterprises Company for evaluation. Mr. Al-Mani added that this company specializes in evaluating technological business ventures. He felt that technology based enterprises required a unique evaluation and thus a special division or company should handle such applications.

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<sup>23</sup> <<http://www.kspdc.com/kspdc/aboutus.html>> 12 Oct. 2006

Mr. Al-Mani indicated that the KSPDC is currently going through many changes; therefore it was not feasible to access previous data for applicants. He also mentioned that many companies were closing and that new evaluation techniques and approaches are needed. What was concluded is that organizations are finding the need to distinguish between non-technological and technological business ventures. Similarly the ability to estimate the entrepreneurial capability of the founder is needed.

#### **4.2.3 National Technology Enterprises Company, Technology Entrepreneurship Center (TEC) – Kuwait**

The Technology Entrepreneurship Center (TEC) seeks and identifies technological ideas and promotes entrepreneurship in order to support business activities. TEC was established in cooperation with the Massachusetts Institute of Technology (MIT) Entrepreneurship Center. TEC's mission is to "invest in the knowledge economy by supporting the development of new technology enterprises, creating a link between private businesses venture capitalists and entrepreneurs, and commercializing research and development projects."<sup>24</sup>

Dr. Adnan Al-Sultan who is the chairman and managing director of TEC was contacted to help in the formalization of the data collection instruments. Dr. Sultan has 21 years of experience in managing investment companies, in academia and in

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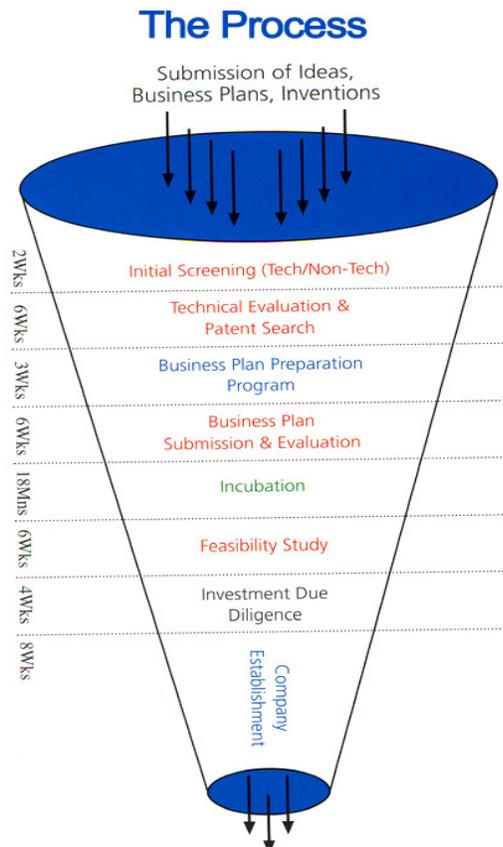
<sup>24</sup> <[www.ntec.com.kw/tec](http://www.ntec.com.kw/tec)> 25 Nov. 2006

consulting. He provided information regarding the process and elements that are used in the evaluation of a technology based business venture. He stated that “technology today is very important and technology based companies can be big contributors to the health of the economy.” Dr. Al-Sultan stressed that technology based companies need to be evaluated differently than non-technical companies. The first step in the process is the determination that the idea is of a technical nature. Once an idea passes as technical, then feasibility analysis commences. If the technology proves to be feasible then an evaluation of the business plan takes place. If it is approved then the technology business venture will become incubated.

Dr. Adnan mentioned that once a technology venture is incubated TEC begins to study the founder. If the founder is more “technical in nature” then TEC will recommend that he/she hold the position of Chief Information Officer (CIO) and not Chief Executive Officer (CEO). Dr. Adnan said that TEC assumes that individuals with strong technical backgrounds do not make good entrepreneurs. Moreover, when asked how they assess the founder, he simply replied “by his or her experience.”

TEC provided business and technical evaluations for five technical start-ups. Because the personality evaluation tool was an on-line test, available in the English language only, Dr. Amani Al-Eisa of the Public Authority of Applied Education and Training (PAAET) administered the tests verbally. Sample evaluation sheets are included for reference as Appendix B. Similarly, Mr. Anas Meerza, the Head of the

Evaluation Committee at TEC provided details regarding the evaluation process. Figure 4-1 illustrates the process that is followed by TEC when evaluating a technological business idea/venture.



**FIGURE 4-1: Technology Entrepreneurship Center Evaluation Process<sup>25</sup>**

<sup>25</sup>< <http://www.ntec.com.kw/tec/engprofile.html#>> 25 Nov. 2006

#### 4.2.4 Knowledge Oasis Muscat (KOM)<sup>26</sup>

KOM is a technology park dedicated to supporting technology-oriented businesses. KOM welcomes startups and early stage technological companies to apply for incubation. KOM holds a business plan competition in cooperation with the Ernst & Young Big Business Idea competition to incubate the winners of the KOM competition. The participant submits a business plan which is evaluated based on the following criteria:

- Strength of the technology or innovation
- Quality of business plan
- Business and market potential
- Management team
- Potential to contribute to the KOM community

Mr. Dave Pender, the Head of Incubation and Mining, indicated that KOM does not use a quantitative method for evaluating an application. KOM is a young technology park. The first group of business plans was evaluated based on a presentation to a committee. The best plan was selected following a committee discussion.

Mr. Pender was very interested in incorporating a formal evaluation process that involved an entrepreneurial test to help profile potential candidates. He stated that

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<sup>26</sup> <[http://www.kom.om/index9406.html?lang=en&sub=about\\_kom](http://www.kom.om/index9406.html?lang=en&sub=about_kom)> 3 Apr. 2007

although it is obvious that the applicants are competent in their subject matter there is no way to assess their entrepreneurial ability. He said “it would be nice to know ahead of time if a person has entrepreneurial ability.”

#### **4.2.5 Mercury Technology Labs, Memphis Tennessee<sup>27</sup>**

Mercury Technology Labs bridges the gap between new technological innovations and commercialization by funding new startups. Mercury Technology Labs “finds the best raw technologies and research talent from research and development labs both academic and industrial, invests management expertise and capital, and creates new technology business ventures.”<sup>28</sup> Eric Mathews, founder and general partner of Mercury Technology Labs, was a strong supporter of the research and his initial response was “this topic is very close to my heart.”

Mr. Mathews mentioned that Mercury Technology Labs evaluates technological companies based on two criteria: the technological innovation and the business concept. Three complete data sets were provided by Mercury Labs for use in the model development. He also expressed that “it would be great if we were able to give the founders a personality test and are able to predict if they are entrepreneurial.” Mr. Mathews mentioned that they are a young company, “a star-up that funds star-ups.”

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<sup>27</sup> < <http://mercurytechlabs.com/aboutus.html> > 16 May 2007

<sup>28</sup> Ibid

#### **4.2.6 FedEx Institute of Technology Business Plan Competition, University of Memphis<sup>29</sup>**

The University of Memphis was the first business plan competition that was observed. Once a year, FedEx Institute of Technology holds a business plan competition that allows teams to present an innovative technological business plan to be reviewed and evaluated by entrepreneurs, professors, venture capitalists and other professionals. The competition aims to foster entrepreneurship in the Mid-South. The team must include at least one student from the University of Memphis; that student is required to make the oral presentation to the panel of judges.

Observing the business plan competition provided insight into the evaluation process. Watching the judges' deliberation strengthened the need for this research. The important factors were readily observed. The personality of the presenter played a critical role in the evaluation of the business plans. Teams were penalized if their student presenters did not display entrepreneurial capabilities. In one case, the top ranked team dropped precipitously because of a weak presentation. Table 4-1 below shows the timeline of the business competition (schedule of events). It is important to note that it takes five months from the moment a team registers until the final presentation.

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<sup>29</sup> <<http://fedex.memphis.edu/BizPlan/index.shtml>> 14 Apr. 2007

**Table 4-1: FedEx Institute of Technology Business Plan Competition Schedule of Events for 2007**

<b>Event</b>	<b>Date</b>
Team Registration Opens	January 1 <sup>st</sup> 2007
Executive Summaries Due	February 28 <sup>th</sup> 2007
Executive Summaries Winners Announced	March 15 <sup>th</sup> 2007
Business Plans Due	April 20 <sup>th</sup> 2007
Semi-Finalists Notifications	April 30 <sup>th</sup> 2007
Business Plan Competition Finals	May 12 <sup>th</sup> 2007

FedEx Institute of Technology divided the applicants that submitted a business summary into three categories: high school, high-technology and low-technology. The executive summary evaluation sheet is identical to the business plan evaluation sheet; the sheet is displayed Appendix B. A winner is chosen from each category. Only the high-technology and low-technology categories submit a full business plan to be evaluated by another set of judges using the same criteria. When the competitors submit the business plan both the high technological business plan and the low-technological business plan are placed in one category. The judges review the business plans and score them. The top six technological plans are chosen to compete in the semifinal round.

In the semifinal round, two sets of three judges evaluated the six teams. Two teams presented simultaneously in separate rooms in front of the panel. The judges were provided with evaluation sheets that had two categories only (the business plan and

presentation). The business plans received a maximum of 25 points and the presentation up to 75 points. A sample evaluation sheet is found in Appendix B.

After the presentations of the six different teams the judges went into the deliberating room. The scores for the (business plan and the presentation) were posted on a white board for each company. In other words there were 6 companies with three scores posted for each. The judges discussed each plan and the ability of the team to move forward with the idea. Following discussion, each judge was asked to remove one company. Then they would deliberate more and remove one more and so on.

The deliberation took a very long time. The acceptance and marketability of each technology was important to many of the judges. One project<sup>30</sup> was scratched off on the basis that one judge felt that this company was focusing on a dated technology that was not viable in today's market. Five of the judges did not agree with that particular judge but when it came to removal of a project that judge selected this start-up. It was very interesting to see how the deliberation took place. The opportunity to observe the judging process provided a window into the minds of the venture capitalists and technical evaluators.

Another observation which was extremely interesting was another company which was the winner of the best high technology executive summary. Moreover, this

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<sup>30</sup> Because these ideas are confidential, no details can be provided in specifics as to what type of technical innovation this company was offering.

company scored very highly in the business plan evaluation, yet it could not make the cut to the finals because of the presentation. In fact one of the judges scored them 10 out of 75. It was widely believed by the judges that had another team member made the presentation, this start-up might have won. Their idea and technology were both exceptional and the idea had great market appeal. Unfortunately in this case, the rules of the competition dictated that the student must present. The scientist who was the inventor of this new technology unfortunately did not have the entrepreneurial and presentation skills needed to sell this business to a panel of venture capitalists. Later this company was funded by Mercury Technology Labs under the condition that the inventor remains as the technology specialist while another partner assumes the marketing and business development role.

The Final Round was similar to the Semifinal round with the exception that this time it was a presentation to the public and anyone may have attended the three final presentations. After the three groups presented, a similar deliberation took place and the first, second and third place winners were announced. Complete data sets for the three finalists were obtained for use in the modeling effort.

#### **4.2.7 Worcester Polytechnic Institute (WPI)<sup>31</sup>**

The Worcester Polytechnic Institute (WPI) Venture Forum seeks to encourage and help entrepreneurs who are interested in creating a technology based venture. The center also sponsors and invests in pre-startups and early stage businesses. Once a year the WPI holds a business plan contest that evaluates technology based business plans.

Ms. Gina Betti, the Administrative Director at the WPI Venture Forum provided information on the evaluation process and evaluation criteria. She indicated the business plan competition is held every year and they consider only technology based businesses. The WPI contest consists of three rounds. In each round the contestants present in front of a panel of judges and are ranked. The evaluation sheets for both rounds are in Appendix B. Unfortunately, no data sets were obtained from WPI.

#### **4.2.8 iPark, Jordan<sup>32</sup>**

iPark is a technology incubator fosters IT growth within Jordan. Mr. Omar Hamarna, manager and evaluator of iPark, detailed the process used in assessing a new technological venture. Mr. Hamarna has been in his current position for the past 5 years and has evaluated over 100 technological business plans. The criteria that iPark uses

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<sup>31</sup><<http://www.wpiventureforum.org/About/>> 22 Oct. 2007

<sup>32</sup><<http://www.ipark.jo/index.html>> 7 Jun. 2007

when evaluating a technological business venture are as follows: People/Process, Financials, Product/Service, Market/Opportunity.

Mr. Hamarna believed that if he were to rate the importance of the technical ability and entrepreneurial ability of person he would rank the technical 2 out of 5 (5 being of high importance) and 5 out of 5 for the entrepreneurial ability. He explained that the technical ability helps to define the vision for a product, but making a venture requires entrepreneurial ability.

#### **4.2.9 Sunshine State Venture Challenge – University of Central Florida<sup>33</sup>**

The University of Central Florida (UCF) in partnership with the National Collegiate Inventors and Innovators Alliance (NCIIA) held a workshop entitled “Invention to Venture” that was attended in support of the research. In a phone interview with Dr. Cameron Ford, he discussed the classes, workshops, and competitions held at UCF to enhance the entrepreneurial spirit.

Dr. Ford mentioned that in 2006 UCF completed their first Sunshine State Venture Challenge, which is a Florida statewide university business plan competition. Unfortunately, no data were saved from the previous business plan. Twelve sets of data

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<sup>33</sup> <<http://www.cei.ucf.edu/Competitions/Statewide/procedures.html>> 24 Oct. 2007

for the 2007 finalists were provided, however only five sets represented technical ventures. Appendix B provides a sample copy of the evaluation sheets used.

#### **4.2.10 Moot Corp, University of Texas at Austin<sup>34</sup>**

Moot Corp is one of the oldest and most distinguished business plan competitions. Every year since 1984, the University of Texas in Austin has conducted a business plan competition. The first winner was given the title “Texas Champion.” As the competition spread throughout the country, the title became “National Champion.” Today the competition encompasses universities around the world and the winner is crowned “Global Champion.” Moot Corp is the gold standard of business plan competitions.

Ms. Ann Whitt, Moot Corp Coordinator has been an instrumental part of the competition since 2000. She corresponds with many institutions around the world that participate. She provided extensive data on the current process. Moot Corp groups plans according to type of innovation; for example software companies are grouped in one division and are evaluated by the same panel of judges. More than one judge evaluates each business plan. Evaluators are experts in both the field of the innovation and business.

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<sup>34</sup> <<http://www.mootcorp.org/index.asp>> 24 Oct. 2007

According to Ms. Whitt, Moot Corp retains detailed records of all business plan evaluations and results. Digital evaluation sheets were available beginning in 2001. Business plan evaluations, technical evaluations and rankings were provided for all contestants since 2001 (representing 229 projects). From these results, eighteen former participants completed the MBTI evaluation. A sample of the Moot Corp evaluation sheets is found in Appendix B.

#### **4.2.11 TiEQuest, Canada<sup>35</sup>**

TiEQuest is an annual business plan competition held in Toronto, Canada. TiEQuest aims to introduce entrepreneurs to venture capitalists that are interested in investing in a promising business venture. In the 2008 business plan competition – “TiEQuest 2008” (application closing date of January 31, 2008) 200 entrepreneurs have registered and are ready to move forward with the evaluation process in hopes of winning first place or securing venture capital. Table 4-2 lists the 2008 TiEQuest business plan competition schedule.

The TiEQuest chair, Mr. Suresh Madan, provided details regarding the evaluation process. He stated that each business plan is evaluated by five different judges using the criteria listed in Table 4-3. Twenty-one complete data sets were provided for the

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<sup>35</sup> <[http://tiequest.org/\\_bin/about/about.cfm](http://tiequest.org/_bin/about/about.cfm)> 28 Jan. 2008

semifinalists and 7 sets of data for the finalists were submitted. These data are used in the model validation.

**Table 4-2: TiEQuest Business Plan Competition Schedule of Events for 2008**

<b>Event</b>	<b>Date</b>
Intention to Participate	January 31 <sup>st</sup> 2008
Project Profile	February 8 <sup>th</sup> 2008
Mentoring Workshop	February 20 <sup>th</sup> 2008
Elevator Pitch	March 8 <sup>th</sup> 2008
Written Business Plan	March 18 <sup>th</sup> 2008
Presentations – Semi-Finals	March 29 <sup>th</sup> 2008
Presentation – Finals	April 10 <sup>th</sup> 2008
Awards Dinner	April 12 2008

**Table 4-3: TiEQuest Business Plan Competition Criteria**

<b>Criteria</b>	<b>Description</b>
<b>Product/Service</b>	Does the venture have sound value proposition? Have contestants developed the product concept clearly? Does the business concept embody innovation and creativity?
<b>Marketability</b>	Is the product/service marketable? Is there a demand? Is there sustainable competitive advantage?
<b>Viability</b>	What is the likelihood of the business plan actually becoming the basis for a viable business? Does the venture technically make sense? Could it be a real business? Will the venture be profitable? Have all the key financial considerations been taken into account in the projections? Does the return justify the investment and the risk?
<b>Management</b>	Is the management knowledgeable, enthusiastic, and committed to the venture? Can they execute it? Do they have a track record?
<b>Action Plan</b>	Are milestones real? Is the venture stable and growth oriented or speculative and risky? Does it have high sensitivity to the actions of competitors, technology, the industry, etc.? When and how will the exit likely happen? Is the strategy appropriate? <sup>36</sup>

<sup>36</sup> <[http://tiequest.org/\\_bin/submission/judgingCriteria.cfm](http://tiequest.org/_bin/submission/judgingCriteria.cfm)> 28 Dec. 2008

Use of the 2008 TiEQuest data in the model validation effort will help avoid hindsight bias. “Hindsight is not equal to foresight” (Fischhoff, 1975). The TiEQuest data are used to predict the final results of the 2008 business plan competition. These data were not used in the model development. In fact, no data from any TiEQuest competition were used in the development of the entrepreneurial model.

### 4.3 Data Collection and Normalization

The research data used in the model development were comprised of information received from the participants of technical business plan competitions at the five institutions shown in Table 4-4. The data series number assigned to each institution is also listed. Each data set, representing a normalized technical score, normalized business score, normalized personality score, and normalized ranking was assigned a unique identifier. The first digit of the data series represents the institution from which the data were received. The number of data sets from each institution is also shown in Table 4-4.

**Table 4-4 Participating Institutions and Data Set Information**

Participating Institution	Data Series	Number of Data Sets
Technical Entrepreneurship Center (TEC), Kuwait City, Kuwait	5000	5
Mercury Technology Labs, Memphis, Tennessee	2000	3
FedEx Institute of Technology, Memphis, Tennessee	1000	3
Sunshine State Venture Challenge, University of Central Florida, Orlando, Florida	3000	5
Moot Corp University of Texas at Austin	4000	17
Total		33

The normalized data collected for the model development are shown in Table 4-5a. Table 4-5b lists the factors compiled to yield the technical and business scores shown in Table 4-5a. In Table 4-5a, column 1 represents a unique identifier for the data, column 2 shows the Jung's Personality type indicator, column 3 depicts the normalized personality score (see Table 3-3), the normalized technical and business scores are listed in columns 4 and 5 respectively, columns 6 through 9 list the percentage scores for the Jung's Personality type indicator shown, and column 10 is the rank of the proposal expressed as a plotting proportion. All data were collected and normalized as discussed in chapter 3.

As noted in section 4.2.3, the personality data for the Technical Entrepreneurship Center (TEC) were collected in a different manner - verbally. Upon analysis, the values for the iNtuitive and Sensing traits were noted to be considerably different (20% higher for Sensing, 20% lower for iNtuitive) for the 5000 series data from TEC. Similarly the values for the Judging and Perceiving traits were 14% different from the remainder of the values. Other institutions did not show a sizable variance from the mean. For this reason the TEC data were not included in the regression analysis.

#### **4.4 Multiple Linear Regression Analysis**

The multiple linear regression model fitted through the origin, relating the dependent variable ( $y$ ) to a set of  $p$  independent variables ( $x$ ), is shown below. The term  $e$  represents the error term which is assumed to be normally distributed.

$$y_i = B_1x_{i1} + B_2x_{i2} + \dots B_p X_{ip} + e_i$$

In the case of the entrepreneurial model development, four different forms of the model were tested. A summary of the model forms, coefficients and adjusted R<sup>2</sup> values are shown in Table 4-6.

**Table 4-5a Data Collection Results**

(1) Num	(2) MBTI	(3) MBTI Score	(4) Tech	(5) Biz	(6) E, %	(7) N, %	(8) T, %	(9) J, %	(10) Rank,
1001	ESTJ	0.65	0.700	0.750	58.06	41.18	73.33	55.17	0.43
1002	ESTJ	0.65	0.600	0.813	52.78	58.54	57.89	38.71	0.71
1003	INTP	1.00	0.550	0.518	37.14	51.43	50	47.22	0.57
2001	ESTJ	0.65	0.700	0.800	51.28	42.42	56.1	58.33	0.75
2003	INTJ	0.78	0.200	0.800	48.39	58.06	72.73	61.29	0.25
2004	ENTJ	0.95	0.700	0.700	55.88	55.26	59.46	58.97	0.50
3001	ESTP	0.39	0.550	0.563	66.67	40	56.41	48.78	0.33
3002	ISTJ	1.00	0.800	0.600	34.29	48.72	60	57.14	0.67
3003	ENTP	0.78	0.950	0.688	54.29	51.22	61.11	50	0.75
3004	ENTJ	0.95	0.600	0.588	50	51.28	57.58	58.82	0.58
3005	ENTJ	0.95	0.300	0.600	59.46	54.29	50	52.78	0.25
4001	ENTP	0.78	0.658	0.715	76.47	58.97	54.29	40	0.80
4002	INTP	1.00	0.729	0.788	33.33	51.52	69.7	37.5	0.80
4003	ESTJ	0.65	0.829	0.806	60.61	29.03	55.88	71.43	0.83
4004	ESTP	0.39	0.772	0.909	51.35	45.71	57.89	48.65	0.50
4005	ESTJ	0.65	0.672	0.748	62.5	42.42	62.5	58.82	0.83
4006	ENFP	0.08	0.822	0.763	67.65	60.61	48.78	42.86	0.83
4008	ENTJ	0.95	0.733	0.710	51.52	57.14	61.76	61.29	0.71
4009	ESTJ	0.65	0.714	0.768	53.33	35	65.79	60	0.33
4010	ISTP	0.43	0.629	0.623	43.75	34.15	65.79	63.64	0.17
4011	INTP	1.00	0.643	0.648	48.28	51.28	54.29	40.63	0.50
4012	ENTP	0.78	0.697	0.711	62.86	66.67	61.54	45.16	0.67
4013	ISTJ	0.65	0.691	0.695	46.88	46.15	69.7	69.44	0.71
4014	ENFP	0.08	0.843	0.805	65.79	57.58	43.9	50	0.83
4015	INTP	1.00	0.872	0.795	22.86	52.38	55.56	41.03	0.67
4016	ESTJ	0.65	0.672	0.655	60	30.77	54.84	52.94	0.60
4017	ENTJ	0.95	0.543	0.561	61.54	56.25	60	62.5	0.40
4018	ESTJ	0.65	0.820	0.776	55.88	47.62	50	63.89	0.83
5001	ESTJ	0.65	0.729	0.807	66.67	16.67	75	79.17	0.88
5002	ESTJ	0.65	0.529	0.572	54.17	12.5	87.5	87.5	0.63
5003	ESTJ	0.65	0.329	0.465	83.33	25	66.67	83.33	0.50
5004	ISTP	0.43	0.471	0.593	37.5	37.5	62.5	37.5	0.75
5005	INTJ	0.78	0.060	0.414	45.83	50	54.17	54.17	0.25

**Table 4-5b Technical and Business Factors**

Technical Evaluation Factors	Business Plan Factors
The product and service Advantages Drawbacks Stage of development Proprietary position or intellectual property protection Venture represents something novel, unique or special to provide competitive advantage in target market Description of Market Competitive Analysis Needs identifications Market acceptance(adoption) Unique Capabilities.	Business purpose Overall strategy Plan of production Product cost Margins Resources required Management Team <ul style="list-style-type: none"> <li>- Background of Key Elements</li> <li>- Ability to execute strategy</li> <li>- Role of executives</li> </ul> Financials <ul style="list-style-type: none"> <li>- Cash Flow Analysis</li> <li>- Income Statement</li> <li>- Balance Sheet</li> <li>- Assumption/Trends/Comparatives</li> </ul> Offering <ul style="list-style-type: none"> <li>- Proposal terms to investors</li> <li>- Exit Strategy</li> </ul> Validity <ul style="list-style-type: none"> <li>- Market opportunity</li> <li>- Distinctive competence</li> <li>- Management understanding</li> <li>- Investment potential</li> </ul>

**Table 4-6 Multiple Linear Regression Models and Results**

Model Description	Adjusted R <sup>2</sup>	Model Coefficients
<b>Model 1</b> <b>Data Series:</b> 1000, 2000, 3000, 4000 <b>Type:</b> Regression through the origin <b>Dependent Variable:</b> Rank <b>Independent Variables:</b> Technical, Business, Extroverted, iNtuitive, Thinking, Judging	.936	Technical: 0.542 Business: 0.364 Extroverted: 0.184 iNtuitive: 0.512 Thinking: -0.652 Judging: 0.042
<b>Model 2</b> <b>Data Series:</b> 1000, 2000, 3000, 4000 <b>Type:</b> Regression through the origin <b>Dependent Variable:</b> Rank <b>Independent Variables:</b> Technical, Business, PValue	.939	Technical: 0.736 Business: 0.141 PValue: 0.006
<b>Model 3</b> <b>Data Series:</b> 1000, 2000, 3000, 4000 <b>Type:</b> Regression through the origin <b>Dependent Variable:</b> Rank <b>Independent Variables:</b> Technical, Business, I50, N50, T50, P50	.945	Technical: 0.739 Business: 0.207 I50: -0.101 N50: 0.552 T50: -0.529 P50: -0.088

Model 1 uses the personality scores for the Extroverted, iNtuitive, Thinking, Judging traits expressed as a proportion. In model 2, the MBTI score is shown as calculated in Table 3-3. In model 3, the personality traits were expressed as differences (positive or negative) from 0.50 (50%). In each model, the inclusion and exclusion criteria were specified in terms of a threshold value of the F statistic. The default values in SPSS were selected for this analysis. A less stringent criteria for removal was set at 0.1 (10%) and the criteria for entry was set at 0.05 (5%). In other words, a significant increase in  $R^2$  according to an F-Test at the 5% test level was relevant. Because multicollinearity is known to have significantly negative impacts on the multiple correlation coefficient, each model regressed at most one dimensional value of a given personality trait (E or I, N or S, T or F, J or P). For example, the [E]xtroverted variable or the [I]ntroverted variable was regressed and not both because the sum of the two values by definition equal 100% and thus they display a strong degree of collinearity. In each model, all variables were determined to be statistically significant. In other words, the business value, technical value, and personality traits all were statistically significant when modeling the rank of a business plan. The adjusted  $R^2$  was the highest for model 3. This model form was used in the validation process.

## 4.5 Model Validation

The TiEQuest data were used in the model validation effort. Table 4-7 shows the results for round 2 of the 2008 business plan competition. The based on an oral interview with the entrepreneurs, four finalists were selected.

**Table 4-7 Data Collection Results for TiEQuest**

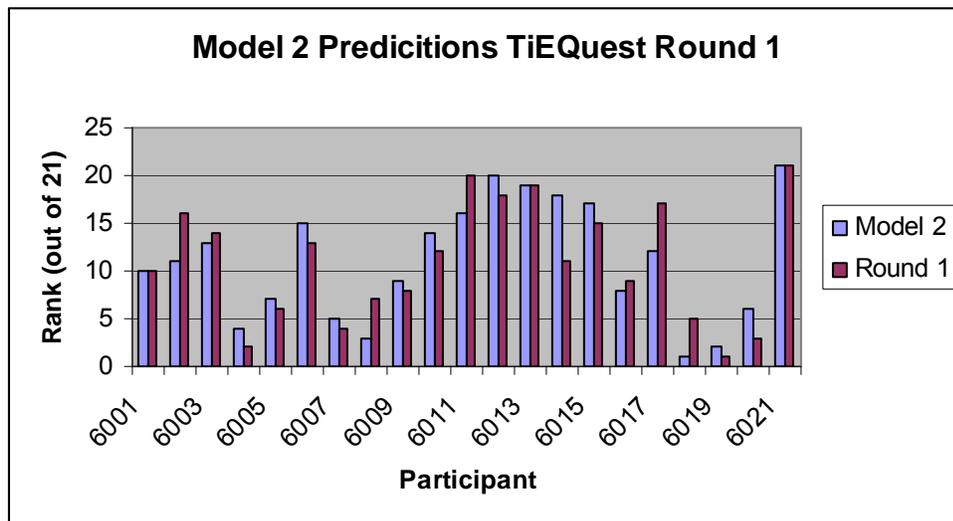
(1) Num	(2) MBTI	(3) MBTI Score	(4) Tech	(5) Biz	(6) E, %	(7) N, %	(8) T, %	(9) J, %	(10) Finals, Y/N
6007	INTP	1	0.691	0.551	45.71	74.19	53.13	31.03	Y
6009	ENFP	0.08	0.709	0.606	55.10	86.67	45.45	13.33	Y
6010	ESTJ	0.65	0.680	0.597	58.62	37.84	68.75	68.57	N
6017	ISFJ	0.04	0.531	0.437	41.18	50.00	35.90	61.11	N
6018	ESTP	0.39	0.543	0.345	66.67	48.39	67.65	48.48	N
6019	ENFJ	0.22	0.720	0.618	62.50	60.61	48.78	61.29	Y
6020	ESTJ	0.65	0.714	0.591	65.71	45.95	70.97	54.29	Y

Using the coefficients established for models 1, 2, and 3, the final ranking values were predicted and compared with the list of finalists and the total of the business and technical scores. Table 4-8 presents the results for the model simulations. Model 2 had very favorable results and predicted the finalists exactly. Both models 1 and 3 selected participant 6017 instead of 6020. Similarly, use of the combined technical and business scores resulted in the selection of candidate 6010 instead of 6007.

**Table 4-8 Model Validation Results – Finalist Predictions for TiEQuest**

(1) Num	(2) Finals, Y/N	(3) Technical and Business Score	(4) Model 1 Predictions	(5) Model 2 Predictions	(6) Model 3 Predictions
6007	Y	60	0.706	0.593	0.721
6009	Y	64.2	0.859	0.607	0.848
6010	N	62.6	0.468	0.5889	0.485
6017	N	47	0.570	0.453	0.559
6018	N	41.4	0.369	0.450	0.386
6019	Y	65.4	0.748	0.618	0.748
6020	Y	63.4	0.518	0.613	0.537

The very promising results of the model 2 predictions led to the development of predictions for round 1 of the TiEQuest competition. Twenty-one sets of data were obtained for the first round evaluation. These data are shown in Table 4-9 with the actual ranking out of 21 and the model 2 predictions. Figure 4-2 graphically displays the results. The correlation coefficient for the ranking and model 2 prediction is 0.88.



**Figure 4-2 Model 2 Predictions for TiEQuest, Round 1**

**Table 4-9 TiEQuest Round 1 Rankings and Model 2 Predictions**

<b>(1) Num</b>	<b>(2) MBTI</b>	<b>(3) MBTI Score</b>	<b>(4) Tech</b>	<b>(5) Biz</b>	<b>(6) Rank (out of 21)</b>	<b>(7) Model 2 Predicted Rank (out of 21)</b>
6001	ISTJ	1	0.629	0.385	10	10
6002	ENFP	0.08	0.600	0.465	16	11
6003	ENTP	0.78	0.560	0.455	14	13
6004	ESTP	0.39	0.777	0.618	2	4
6005	ENFP	0.08	0.680	0.535	6	7
6006	ESTJ	0.65	0.554	0.455	13	15
6007	INTP	1.00	0.720	0.695	4	5
6008	ISTJ	1.00	0.789	0.578	7	3
6009	ENFP	0.08	0.640	0.594	8	9
6010	ESTJ	0.65	0.543	0.526	12	14
6011	ENFJ	0.22	0.543	0.406	20	16
6012	ISTP	0.43	0.429	0.323	18	20
6013	ENFP	0.08	0.503	0.406	19	19
6014	ISTJ	1.00	0.509	0.434	11	18
6015	ENTJ	0.95	0.531	0.428	15	17
6016	ENTJ	0.95	0.657	0.545	9	8
6017	ISFJ	0.04	0.554	0.526	17	12
6018	ESTP	0.39	0.886	0.646	5	1
6019	ENFJ	0.22	0.779	0.808	1	2
6020	ESTJ	0.65	0.726	0.625	3	6
6021	ESFJ	0.04	0.400	0.262	21	21

## Chapter 5: Conclusion and Recommendation

### 5.1 Overview

This section revisits my hypothesis and research questions to offer a conclusion based on the findings that were presented in chapter four and its contribution to the field of technical entrepreneurship. It also discusses the limitations and risks of the model and findings. The chapter concludes with recommendations for future work.

*The ranking of a technical start-up can be estimated based on the value of three factors: the technological innovation, the business plan and the personality of the technical entrepreneur.*

**H<sub>1</sub>** *The merit of the technical product or service is significantly correlated with the early success of the technological enterprise (Hypothesis – H<sub>1</sub>)*

All, models indicated that the technical value was significant. The Pearson Coefficient relating the correlation between technical value and ranking was 0.664 which is significant at the 0.01 level (2-tailed). The results of the Pearson Coefficient analysis are shown in Appendix I.

**H<sub>2</sub>** *The merit of the business plan is significantly correlated with the early success of the technological enterprise (Hypothesis - H<sub>2</sub>)*

As with the technical value, the business value was also statistically significant. The Pearson Coefficient relating the correlation between business value and ranking was 0.384 which is significant at the 0.05 level (2-tailed). The results of the Pearson Coefficient analysis are shown in Appendix I.

**H<sub>3</sub>** *The personality type of the technical entrepreneur is significantly correlated with the early success of the technological enterprise (Hypothesis – H<sub>3</sub>)*

The personality type, as reflected by Jung's Personality evaluation, was statistically significant no matter how the data were normalized. The three models used different approaches in the normalization of the personality trait values. Their inclusion and exclusion criteria were specified in terms of threshold values of the F statistic: the significance for removal was set at 0.1 (10%) and the significance for entry was set at 0.05 (5%). Thus a significant increase in R<sup>2</sup> according to an F-Test at the 5% test level was relevant.

## 5.2 Revisiting the Research Questions

1. Can the success of a technological start-up be modeled?

The success of a technological start-up can be modeled using a multi-linear regression analysis. This was accomplished using past business plan competition evaluations completed by technical and business experts. The results of the multi-linear regression analysis indicated that the combination of technical value, business value, and personality trait information predicted the success. The model results were used to predict the outcome of an entrepreneurial business plan competition. Model 2 was able to predict the finalists without error. Model 2 rank predictions were highly correlated with the actual rankings ( $R^2=0.88$ ).

2. How can the model be used as a tool for the evaluation of a new technological enterprise?

The results of the models can be used to help evaluators, venture capitalists and interested funding institutions to evaluate and screen technical start-ups without the expense of panel presentations. In many cases, business plan competitions have multiple presentations (Elevator Pitch, Executive Summary Presentation, and Full Business Plan Presentation). This method is useful because it does not require any effort on the part of the evaluator; rather it requires that the entrepreneur takes a personality test. The results

of the model help to evaluate and screen entrepreneurial teams in a quick efficient manner.

3. What personality criteria contribute to the success of a new technical venture?

Jung's Personality Traits were significant in the multiple-linear regression analyses. Models 1, 2 and 3 represented the eight different types (E,I,N,S,T,F,J and P) in different ways. However in each case all four traits were found to be statistically significant.

4. What is the dominant contributor for a successful enterprise: the technical entrepreneur, business plan, or the technological innovation?

Table 5-1 briefly summarized the reduction in error associated with the regression of each independent variable singularly with the rank. As shown, the technical value accounted for 41.9% of the error, the business value accounted for 11.5 % of the error, with 5% of the error for the personality indicator.

**Table 5-1 Adjusted R<sup>2</sup> Values Single Indicator Regression**

Independent Variable	Adjusted R <sup>2</sup>
Technical	0.419
Business	0.115
E50, N50, T50, J50	0.050

5. What are the main factors that lead to early funding of a technological enterprise?

The primary factors that contribute to early success are the independent variables that were found to be statistically significant in the model: the technical innovation, the business plan and the personality traits.

### **5.3 Strengths of the Model**

Model 2 was able to predict the semi-finalist ranks with a high degree of confidence and accuracy. Similarly the top four of seven finalists were selected by the model. Therefore, one strength in the model lies in its ability to rank and screen business plan participants which in turn allows for more time to be spent evaluating and mentoring the finalists.

Another strength lies in the models' ability to indicate score improvements by incorporating additional partners with the correct personality types onto the management team. The model can be used by entrepreneurial teams to screen potential partners.

Yet another strength lies in the model's flexibility. Data were collected from literally around the world (Kuwait, Canada and the U.S.). No attempt was made to evaluate the technical or business values or evaluation methodology. A standardized method for evaluation was not used. The data were normalized using the same

methodology and a model emerged that was able to make accurate predictions regarding a technical business plan competition being held in a different country than that represented in the data collection. The model accurately ranked and predicted the semi-finalists and finalists. If nothing else, the model is indeed flexible in its ability to use a wide variety of data as defined by the institution to be relevant.

#### **5.4 Limitations and Risks**

The data collection was very challenging. It shed light on a number of limitations in including personality type in an evaluation. First and foremost, participants were reticent to complete the Personality test and submit the scores. The personal nature of this information might make the participants uncomfortable in answering questions such as “Are you weird?” (See Appendix D). Even though capturing the data during the competition had a higher turnaround rate such as the case with TiEQuest, the contestants were concerned that the data would in some way, be reflected in the evaluation. “I am uncomfortable taking a personality test” was the replay of one of the participants. A great deal of “PR” would need to accompany the test before it could be universally used, despite the fact that many of the program administrators showed interest in a methodology that would evaluate the entrepreneurial ability of the founder.

Many institutions are leery of saving evaluation data. The institutionalization of this methodology would require accurate record keeping and recording as well as security

of the data retention. This would require a change in the manner that the competitions are currently being managed.

## **5.5 Recommendations**

Despite these limitations, the positive results suggest the need for incorporation of personality information in the evaluation process. Before adoption of the model, interested institutions would be advised to test the model accuracy before it is included. Following a successful pilot test, the model could be used on one phase of an evaluation to streamline any logistical concerns. Once the model was demonstrated in the pilot stage, full adoption could be recommended.

Research into the development of a standard to evaluate the business plan competition methodologies is recommended. Looking into a standard such as the International Organization of Standardization – maybe an ISO 9000 – would benefit both the inventor/innovation and the business. The model should address quality improvements to the evaluation of the business, technical and personality values.

This study was limited to the use of the Jung's Personality exam results. Other personality tests and indicators should be investigated to determine the best way of capturing the contribution of this important indicator.

Finally, widespread testing of the ideas and finding within this research will further the understanding of the business, technical and personality indicators. As the data set grows and expands to other individuals and institutions, so will the understanding of the evaluation process at an early stage in the life of a new technical venture. The contribution of personality type to the long term success of technical ventures remains to be investigated.

**Appendix A: Business Plan Competitions and URLs and Timelines**

<b>Name of business plan Competition and Institutions</b>	<b>TimeLine of Competition</b>	<b>Amount of Money Spend</b>	<b>Comments</b>
Alabama Launchpad	6 Months	\$175,000	
<a href="http://www.alabamalaunchpad.com/competition.html">http://www.alabamalaunchpad.com/competition.html</a>			
The \$100K Innovation Challenge @ Case Case Western Reserve University	2 Months	\$100,000	
<a href="http://www.case.edu/The100KChallenge/index.html">http://www.case.edu/The100KChallenge/index.html</a>			
Big Bang University of UC davis	8 months	\$20,000	
<a href="http://bigbang.gsm.ucdavis.edu/about/about.html">http://bigbang.gsm.ucdavis.edu/about/about.html</a>			
Boomer Business Plan Competition	1 month	\$20,000	
<a href="http://boomerventuresummit.com/competition/">http://boomerventuresummit.com/competition/</a>			
Purdue university	6 Months	\$84,000	
<a href="http://discoverypark.purdue.edu/wps/portal/bdm">http://discoverypark.purdue.edu/wps/portal/bdm</a>			
Real Angels Venture Capital Group, Bi-national Sustainability Laboratory, University of Texas at El Paso College of Business,	4 Months	\$15,000	
<a href="http://caminorealcompetition.org/">http://caminorealcompetition.org/</a>			
University of Louisville Business Plan Competition	4 Months	\$30,000	

<a href="http://business.louisville.edu/content/view/511/738//">http://business.louisville.edu/content/view/511/738//</a>			
Donald W. Reynolds Governor's Cup	3 Months	\$104,000	
<a href="http://aeac.arcapital.com/governors_award/">http://aeac.arcapital.com/governors_award/</a>			
Duke University Business plan Competition	6 Months	\$35,000	
<a href="http://www.dukestartupchallenge.org/">http://www.dukestartupchallenge.org/</a>			
Economic Fuel	5 Months	\$117,000	
<a href="http://www.economicfuel.org/aboutus.html">http://www.economicfuel.org/aboutus.html</a>			
University of Virginia's Darden Graduate School of Business	2 Weeks	\$30,000	
<a href="http://www.innovationchallenge.com/">http://www.innovationchallenge.com/</a>			
Gonzaga University	2 Months	42,500	
<a href="http://www.gonzaga.edu/Academics/Undergraduate/Special+Programs/Hogan+Entrepreneurial+Leadership+Program/Business+Plan+Competition/default.asp">http://www.gonzaga.edu/Academics/Undergraduate/Special+Programs/Hogan+Entrepreneurial+Leadership+Program/Business+Plan+Competition/default.asp</a>			
Great Lakes Entrepreneur's Quest	5 Months	119,000	
<a href="http://gleq.org/gleq.nsf/index.html">http://gleq.org/gleq.nsf/index.html</a>			
Harvard Business School	6 Months	\$25,000	
<a href="http://www.hbs.edu/entrepreneurship/bplan/overview.html">http://www.hbs.edu/entrepreneurship/bplan/overview.html</a>			
University of Texas at Austin	5 Months	\$25,000	
<a href="http://www.ideatoproduct.org/">http://www.ideatoproduct.org/</a>			
Intel + UC Berkeley	4 Months	\$45,000	

Technology Entrepreneurship			
<a href="http://www.entrepreneurshipchallenge.org/2007%20winners.htm">http://www.entrepreneurshipchallenge.org/2007%20winners.htm</a>			
Brisbane Graduate School of Business – Queensland University of Technology, Australia	1 month	\$25,000	
<a href="http://www.johnheinechallenge.org/">http://www.johnheinechallenge.org/</a>			
The Lunar Ventures ( hosted by Hosted by Colorado School of Mines)	6 Months	\$127,000	
<a href="http://www.8clunarventures.com/index.shtml">http://www.8clunarventures.com/index.shtml</a>			
Moot Corp University of Texas at Austin	6 Months	\$100,000	
<a href="http://www.mootcorp.org/">http://www.mootcorp.org/</a>			
McGinnis Venture Competition	5 Month	\$41,000	
<a href="http://www.mcginnisventurecompetition.com/">http://www.mcginnisventurecompetition.com/</a>			
– Pepperdine University.	6 Months	\$30,000	
<a href="http://bschool.pepperdine.edu/students/bplan/">http://bschool.pepperdine.edu/students/bplan/</a>			
Lundquist University of Oregon	2 month	\$50,000	
<a href="http://venturechampionship.com/index.php/coverage/prizes/">http://venturechampionship.com/index.php/coverage/prizes/</a>			
University of Chicago	6 months	\$85,000	
<a href="http://research.chicagogsb.edu/nvc/">http://research.chicagogsb.edu/nvc/</a>			
University of California, Santa Barbara.	5 months	\$33,000	
<a href="http://www.tmp.ucsb.edu/extracurricular/nvc.html">http://www.tmp.ucsb.edu/extracurricular/nvc.html</a>			
Nebraska Center for Entrepreneurship	8 Months	\$40,000	

University of Nebraska-Lincoln			
<a href="http://www.cba.unl.edu/outreach/ent/bpc/">http://www.cba.unl.edu/outreach/ent/bpc/</a>			
Essex County, Massachusetts	9 Months	\$200,000	
<a href="http://www.enterprisectr.org/bpc/home18.html">http://www.enterprisectr.org/bpc/home18.html</a>			
Hosted by Boise State University	7 Months	\$41,000	
<a href="http://www.northwestventurechampionship.org/">http://www.northwestventurechampionship.org/</a>			
Clark Atlanta University	6 Months	\$37,000	
<a href="http://www.ofcvc.org/">http://www.ofcvc.org/</a>			
Queens Economic Development Corporation	5 Months	\$28,000	
<a href="http://www.queensny.org/bplancomp/index.htm">http://www.queensny.org/bplancomp/index.htm</a>			
the Rice Alliance for Technology and Entrepreneurship Rice University	6 Months	\$675,000	
<a href="http://www.alliance.rice.edu/alliance/RBPC.asp">http://www.alliance.rice.edu/alliance/RBPC.asp</a>			
by the Asper Centre for Entrepreneurship University of Manitoba	7 Months	\$28,750	
<a href="http://www.stuartclark.org/">http://www.stuartclark.org/</a>			
University of Colorado	4 Months	\$40,000	
<a href="http://leeds.colorado.edu/entrep/interior.aspx?id=295,411,484,1889">http://leeds.colorado.edu/entrep/interior.aspx?id=295,411,484,1889</a>			
Hosted by Rensselaer polytechnic Institute (NY)	1 Months	450,000	
<a href="http://www.lallyschool.rpi.edu/programs/index.cfm?p=5&amp;c=2&amp;inc=severino-program-detail&amp;progID=11">http://www.lallyschool.rpi.edu/programs/index.cfm?p=5&amp;c=2&amp;inc=severino-program-detail&amp;progID=11</a>			
UC Berkeley	Year Round	\$45,000	
<a href="http://bplan.berkeley.edu/">http://bplan.berkeley.edu/</a>			
The University of San Francisco	6 Months	\$25,000	
<a href="http://www.usfca.edu/sobam/nvc/">http://www.usfca.edu/sobam/nvc/</a>			

Hosted by University of Utah	3 Months	\$80,000	
<a href="http://www.uec.utah.edu/">http://www.uec.utah.edu/</a>			
University of Massachusetts	2 Months	\$10,000	
<a href="http://www.uml.edu/uml10k/calendar.htm">http://www.uml.edu/uml10k/calendar.htm</a>			
Washington State University, Seattle Pacific University, Pacific Lutheran University, Seattle University, and the University of Washington.	6 Months	\$40,000	
<a href="http://bschool.washington.edu/cie/bpc/">http://bschool.washington.edu/cie/bpc/</a>			
Hosted by University of North Carolina	6 Months	\$13,000	
<a href="http://www.vcic.unc.edu/students.rules.asp">http://www.vcic.unc.edu/students.rules.asp</a>			
Entrepreneurial Management Center San Diego State University	6 Months	\$22,500	
<a href="http://emc.sdsu.edu/pageVentureChallengePrizes.shtml">http://emc.sdsu.edu/pageVentureChallengePrizes.shtml</a>			
Center for Entrepreneurial & Family Enterprises at Colorado State University.	2 Months	\$12,000	
<a href="http://www.biz.colostate.edu/cefe/">http://www.biz.colostate.edu/cefe/</a>			
Hosted by Wake Forest University	2 Months	\$105,000	
<a href="http://www.mba.wfu.edu/default.aspx?id=268">http://www.mba.wfu.edu/default.aspx?id=268</a>			
Wharton university	7 Months	\$35,000	
<a href="http://bpc.wharton.upenn.edu/info/contacts.html">http://bpc.wharton.upenn.edu/info/contacts.html</a>			
Wisconsin Technology Council	5 Months	\$200,000	
<a href="http://www.govsbizplancontest.com/">http://www.govsbizplancontest.com/</a>			
Worcester Polytechnic Institute Massachusetts	2 Months	\$15,000	
<a href="http://www.wpiventureforum.org/Contest/">http://www.wpiventureforum.org/Contest/</a>			

## **Appendix B: Evaluation Sheets of Business Plans**

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### **Organization**

FedEx Institute of Technology Business Plan Competition Evaluation Form

Technology Entrepreneurship Center Business Plan Evaluation Form

WPI Venture Forum Business Plan Evaluation Form

MOOT CORP Business Plan Evaluation Form

Sunshine State Venture Challenge Business Plan Evaluation Form

TiEQuest Business Plan Competition Evaluation Form

**FedEx Institute of Technology**

**Business Plan Competition 2007**

**Judging Criteria**

Team: \_\_\_\_\_

Business Description (1 – 12 points) \_\_\_\_\_

Market Opportunity (1 – 8 points) \_\_\_\_\_

Market Size (1 – 5 points) \_\_\_\_\_

Technology/Product (1 – 10 points) \_\_\_\_\_

Competitive Advantage (1 – 10 points) \_\_\_\_\_

Business Model (1 – 10 points) \_\_\_\_\_

Management Team (1 – 5 points) \_\_\_\_\_

Financial Highlights (1 – 8 points) \_\_\_\_\_

Use of Proceeds (1 – 8 points) \_\_\_\_\_

(Perfect Score: 76)

Comments

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<p style="text-align: center;"><b>Business Plan EVALUATION FORM</b></p>
---

**Team Members:**

**Invention or idea:**

**Judge Name:**

1. Please find appended a copy of the Business Plan and Evaluation Form
2. Kindly complete the Evaluation Form and return fax to us at (fax number on front page) or email return (with scanned signature for final page).
3. As each Business Plan has two judges, we will then schedule a conference call to discuss results with both judges.

Thank you for your assistance

TEC Team

**1. COMMITMENT: (value = 10%)**

Please evaluate the *Applicant's Commitment* using the criteria below: (*For TEC Staff Members Use Only*)

- |                                       |                               |                              |
|---------------------------------------|-------------------------------|------------------------------|
| 1. Punctual (2 points)                | Yes: <input type="checkbox"/> | No: <input type="checkbox"/> |
| 2. Attendance on all days (4 points)  | Yes: <input type="checkbox"/> | No: <input type="checkbox"/> |
| 3. Classroom participation (4 points) | Yes: <input type="checkbox"/> | No: <input type="checkbox"/> |

**4. Total value (out of 10):** \_\_\_\_\_

## **2. WRITTEN BUSINESS PLAN:(value = 30%)**

Please evaluate the quality of the research, data and persuasiveness of the information in the *Written Business Plan* using the criteria below:

### **1. Executive Summary & Company Overview**

(What problem are you solving? What is your business proposition for solving the problem? Who are your customers? Who are your competitors? How viable is your business? How do you make money? Executive Summary is clear & effective as a stand-alone document.)

Poor	fair	good	very-good	Excellent
1	2	3	4	5

Comments/Questions: \_\_\_\_\_

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### **2. Products or Services**

(What is the product or service? What are its attributes? Advantages and potential drawbacks? Why/how is your product/service more compelling than existing ones or the competition? What is the stage of development? Do you have a proprietary position or intellectual property protection planned or in place?)

Poor	fair	good	very-good	Excellent
1	2	3	4	5

Comments/Questions: \_\_\_\_\_

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### **3. Market Need**

(What specific conditions in the market have created the problem you are solving? How will your product/service take advantage of the opportunity? Who are your customers and what are their attributes? Clearly define your potential customers and why they will pay for your product or service.)

Poor	fair	good	very-good	Excellent
1	2	3	4	5

Comments/Questions: \_\_\_\_\_

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### **4. Market Potential for Your Product or Service**

(What are the characteristics of the market for your product or service? How will you reach the market? How big is the market opportunity: number of potential customers & annual sales? Can you narrow the market to a manageable segment? How will you dominate the market? e.g. through pricing, quality, geography, etc? Is there a market niche where you will have competitive advantage?)

Poor	fair	good	very-good	Excellent
1	2	3	4	5

Comments/Questions: \_\_\_\_\_

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**5. Competitive Advantage**

(Competitive Matrix: Who are your competitors? Their strengths & weaknesses? Your strengths & weaknesses? How will you close the gap? How easily can competition close gap?)

Poor	fair	good	very-good	Excellent
1	2	3	4	5

Comments/Questions: \_\_\_\_\_

**6. Management**

(Who are key team members and their respective roles? What are their relevant experiences and accomplishments? What other areas of expertise are you lacking? When will you need additional team members?)

poor excellent	fair	good	very	good
1	2	3	4	5

Comments/Questions: \_\_\_\_\_

**7. Financial Forecasts**

(Present in summary form, consistent with plan and effective in capturing financial performance; quarterly for first two years, annually for years 3-5.)

	poor	fair	good	very good	excellent
a. Cash Flow Statement	1	2	3	4	5
b. Income Statement	1	2	3	4	5
c. Balance Sheet	1	2	3	4	5
d. Funds Required & Uses	1	2	3	4	5
e. Key Assumptions (trends, comparatives)	1	2	3	4	5

Comments/Questions: \_\_\_\_\_

**8. Total value (out of 35):** \_\_\_\_\_

**Written Plan Additional Comments:**

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**3. PRESENTATION (value = 5%)**

Please evaluate the *Business Plan Presentation* using the criteria below: (*For TEC Staff Members Use Only*)

**1. Formal Presentation**

	poor	fair	good	very good	excellent
a. Materials presented in clear, logical form	1	2	3	4	5
b. Ability to relate need for the start up, convincing, compelling reasons	1	2	3	4	5
c. Ability to maintain judges' interest	1	2	3	4	5
d. Quality of PowerPoint Slides	1	2	3	4	5

**2. Questions and Answers**

a. Ability to understand judges' inquiries	1	2	3	4	5
b. Responds appropriately to judges' inquiries with substantive answers	1	2	3	4	5
c. Effective use of time allocated (minimal redundancy in slides)	1	2	3	4	5
d. Poise and confidence (think effectively on their feet)	1	2	3	4	5

**3. Total value (out of 40):** \_\_\_\_\_

**Presentation Additional Comments:** \_\_\_\_\_

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**4. VIABILITY OF BUSINESS PROPOSED (value = 55%)**

Please provide a *Subjective Evaluation*, based upon your professional experience, of the viability of the business plan below:

	Definitely Not Viable				Definitely Viable	
	1	2	3	4	5	
<b>1. Market Opportunity</b> (clear market need & way to seize the opportunity.)						
<b>2. Distinctive Competence</b> (new venture presents something novel, unique or special to provide competitive advantage in target market.)						
<b>3. Management Capability</b> (team can effectively launch & develop the venture.)						
<b>4. Financial Understanding</b> (team has solid understanding of financial requirements of the business.)						
<b>5. Investment Potential and Plan Strength</b> Venture presents an investment opportunity for {please check all that apply}:	<b>Weak Plan</b>			<b>Adequate Initial Plan</b>		<b>Strong Plan</b>
Self-finance by founders	1	2	3	4	5	
Investment by friends & family	1	2	3	4	5	
Investment by private individuals/angels	1	2	3	4	5	
Investment by early stage venture capitalists	1	2	3	4	5	

**6. Total value (out of 40):** \_\_\_\_\_

## **5. BUSINESS PLAN FINAL SCORE**

### **1. Commitment:**

Participant's commitment - total value out of 10: a) \_\_\_\_\_

Percentage weighting = (a) x 10%: b) \_\_\_\_\_

### **2. Written Business Plan:**

Team's written business plan - total value out of 35: c) \_\_\_\_\_

Percentage weighting = (c) x 30%: d) \_\_\_\_\_

### **3. Presentation:**

Quality of team's presentation - total value out of 40: (e) \_\_\_\_\_

Percentage weighting = (e) x 5%: (f) \_\_\_\_\_

### **4. Viability of Business Proposed:**

Evaluation of viability of business proposal - total value out of 40: (g) \_\_\_\_\_

Percentage weighting = (g) x 55%: (h) \_\_\_\_\_

### **5. Overall Score:**

Numerical total:

Participant's commitment (a) + Team's written business plan (c) + Quality of team's presentation total value out of 40 (e) + Evaluation of viability of business proposal (g)

(i) \_\_\_\_\_

Percentage weighting:

Percentage weighting (b) + Percentage weighting (d) + Percentage weighting (f) +

Percentage weighting (h)

(j) \_\_\_\_\_

**Date:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

## WPI Venture Forum 2007 Business Plan Contest Judge's Scoring Sheet for Round 1

Use this form to score each criterion below by circling a number from 1-5, with 1 signifying the lowest rating and 5 the highest. Scores should be based on a contestant's executive summary and oral presentation.

Name of Business: \_\_\_\_\_

Name of Judge: \_\_\_\_\_ Permission to share anonymous results \_\_\_\_\_

### **Viability** *Can this team create a profitable business?*

Low                      High

• Financial: Is the business model feasible?	1	2	3	4	5
• Market: Is there a clear market need and customer demand with an adequate addressable market size?	1	2	3	4	5
• Competition: Can the business model succeed given the competition in the marketplace?	1	2	3	4	5
• Management team: Is the team composed of diverse people with complimentary skills and knowledge or does it have a realistic ability to create such a team?	1	2	3	4	5
• Milestones: Are upcoming financial, technical, and organizational milestones clear and does the intended use of capital make sense?	1	2	3	4	5
• Technology: Is the technology practical/possible? Is it unique? Difficult to replicate? Is it sufficiently protected from an intellectual property standpoint?	1	2	3	4	5

### Compelling Case **Has the team made a clear, convincing argument for success?**

• Has the team clearly shown that the business model is realistic? Does the team know how it will make money?	1	2	3	4	5
• Has the team defined a significant customer problem and described a solution with clearly defined benefits for potential customers?	1	2	3	4	5
• Has the team made a compelling case that it has and can implement a strategy for earning adequate market share?	1	2	3	4	5

• Has the team adequately discussed its competition and shown that it will have a clear competitive advantage?	1	2	3	4	5
• Has the team clearly defined its marketing plan and sales strategy?	1	2	3	4	5

***Aha! Factor Is the story exciting?***

• Does the story capture the imagination of the audience?	1	2	3	4	5
• Does the story truly motivate someone to invest money, become a strategic partner, join the team, or become a mentor?	1	2	3	4	5
• Will this business be a disruptive business, provoke a paradigm shift or introduce revolutionary technology?	1	2	3	4	5

***Written and Oral Presentation***

• Was the executive summary well-organized and written in clear, concise English with no typos? Did the formatting and overall “look” of the document convey a professional image?	1	2	3	4	5
• Was the oral presentation well organized, concise and delivered in a polished, professional manner?	1	2	3	4	5
• Did the executive summary and oral presentation describe the company and its business in such a way that an investor who was not familiar with the company’s business could understand the Company’s products, its market, and its business plan? Did the executive summary and presentation avoid being too technical?	1	2	3	4	5

**Comments**

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**MOOT CORP®**  
**Judge's Evaluation**

Company: \_\_\_\_\_ Judge No: \_\_\_\_\_

**I. Written Business Plan (40%)**

**Please evaluate the written business plan on the following aspects:**

(Using this rating system: 1 = very poor, 2 = poor, 3 = fair, 4 = adequate, 5 = good, 6 = very good, 7 = excellent)

**1. Executive Summary (5%)**

(Clear, exciting and effective as a stand-alone overview of the plan)

1    2    3    4    5    6    7

Comments/Questions \_\_\_\_\_

**2. Company Overview (5%)**

(Business purpose, history, genesis of concept, current status, overall strategy and objectives)

1    2    3    4    5    6    7

Comments/Questions \_\_\_\_\_

**3. Products or Services (10%)**

(Description, features and benefits, pricing, current stage of development, proprietary position)

1    2    3    4    5    6    7

Comments/Questions \_\_\_\_\_

**4. Market and Marketing Strategy (10%)**

(Description of market, competitive analysis, needs identification, market acceptance, unique capabilities, sales/promotion)

1    2    3    4    5    6    7

Comments/Questions \_\_\_\_\_

**5. Operations (15%)**

(Plan for production / delivery of product or services, product cost, margins, operating complexity, resources required)

1    2    3    4    5    6    7

Comments/Questions \_\_\_\_\_

**6. Management (10%)**

(Backgrounds of key individuals, ability to execute strategy, personnel needs, organizational structure, role of any non-student executive, which students will execute plan)

1    2    3    4    5    6    7

Comments/Questions \_\_\_\_\_

In rating each of the above, please consider the following questions:

- Is this area covered in adequate detail?
- Does the plan show a clear understanding of the elements that should be addressed?
- Are the assumptions realistic and reasonable?

## MOOT CORP® Judge's Evaluation

Company: \_\_\_\_\_ Judge No: \_\_\_\_\_

(Using this rating system: 1 = very poor, 2 = poor, 3 = fair, 4 = adequate, 5 = good, 6 = very good, 7 = excellent)

**7. Summary Financials (10%)**

Presented in summary form and are easy to read and understand.  
Consistent with plan and effective in capturing financial performance; Monthly for year 1, Quarterly for years 2-3, annually for years 4-5.

a. Cash Flow Statement	1	2	3	4	5	6	7
b. Income Statement	1	2	3	4	5	6	7
c. Balance Sheet	1	2	3	4	5	6	7
d. Funds Required/Uses	1	2	3	4	5	6	7
e. Assumptions/Trends/Comparatives	1	2	3	4	5	6	7

Comments/Questions \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**8. Offering (10%)**

(Proposal/terms to investors--indicates how much needed, the ROI, the structure of the deal, and possible exit strategies)

1	2	3	4	5	6	7
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Comments/Questions \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**9. Viability (20%)**

(Market opportunity, distinctive competence, management understanding, investment potential)

1	2	3	4	5	6	7
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Comments/Questions \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**10. Brevity and Clarity (5%)**

(Is the plan approximately 25 pages with minimal redundancy)

1	2	3	4	5	6	7
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Comments/Questions \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

<b>Additional Comments</b>

**MOOT CORP®**  
**Judge's Evaluation**

Company: \_\_\_\_\_ Judge No: \_\_\_\_\_

**II. Presentation (20%)**

(Using this rating system: 1 = very poor, 2 = poor, 3 = fair, 4 = adequate, 5 = good, 6 = very good, 7 = excellent)

**1. Formal Presentation (50%)**

a. Materials presented in clear, logical and/or sequential form.	1	2	3	4	5	6	7
b. Ability to relate need for the company with meaningful examples, and practical applications.	1	2	3	4	5	6	7
c. Ability to maintain judges' interest.	1	2	3	4	5	6	7
d. Quality of Visual Aids.	1	2	3	4	5	6	7

**2. Questions and Answers (50%)**

a. Ability to understand judges' inquiries.	1	2	3	4	5	6	7
b. Appropriately respond to judges' inquiries with substantive answers.	1	2	3	4	5	6	7
c. Use of time allocated (minimal redundancy).	1	2	3	4	5	6	7
d. Poise and confidence (think effectively on their feet).	1	2	3	4	5	6	7

**Strengths of Presentation**

**Weaknesses of Presentation**

- more on other side -

**MOOT CORP®**  
**Judge's Evaluation**

Company: \_\_\_\_\_ Judge No: \_\_\_\_\_

**III. Viability of Company (40%)**

	Definitely No					Definitely Yes	
<b>1. Market Opportunity (20%)</b> (There is a clear market need presented as well as a way to take advantage of that need.)	1	2	3	4	5	6	7
<b>2. Distinctive Competence (20%)</b> (The company provides something novel/unique/special that gives it a competitive advantage in its market.)	1	2	3	4	5	6	7
<b>3. Management Capability (20%)</b> (This team can effectively develop this company and handle the risks associated with the venture.)	1	2	3	4	5	6	7
<b>4. Financial Understanding (20%)</b> (This team has a solid understanding of the financial requirements of the business.)	1	2	3	4	5	6	7
<b>5. Investment Potential (20%)</b> (The business represents a real investment opportunity in which you would consider investing.)	1	2	3	4	5	6	7

**Company Strengths**

**Company Weaknesses**

**Additional Comments**

## 2<sup>st</sup> Annual Sunshine State Venture Challenge

### Admissions Committee

### Assessment Form

*Co-hosted by UCF and Rollins College*

Please assess this plan on the following criteria. Your assessments may be based on any information that you believe is relevant to the viability of this plan regardless of whether the information is provided in the written proposal.

Proposal Name: \_\_\_\_\_ Total Score\_\_\_\_\_

POINTS POSSIBLE	JUDGING CRITERIA	POINTS AWARDED (OUT OF 10, EXCEPT WHERE NOTED)	COMMENTS FOR BUSINESS PLAN CONTESTANTS (OPTIONAL)
10	<b>Market Opportunity</b> There is a clear market need presented as well as a way to take advantage of that need		
10	<b>Products or Services</b> Description, features/benefits, pricing, current stage of development, proprietary position		
10	<b>Competitive Advantage</b> The company provides something novel, unique, or special that gives it a distinct competitive advantage in its market		
10	<b>Market &amp; Marketing Strategy</b> Description of the market, trends, competitive analysis, needs identification, sales/promotions		

POINTS POSSIBLE	JUDGING CRITERIA	POINTS AWARDED (OUT OF 10, EXCEPT WHERE NOTED)	COMMENTS FOR BUSINESS PLAN CONTESTANTS (OPTIONAL)
10	<b>Operations</b> Plan for production/delivery of product or services, product cost, resources required		
10	<b>Management Capability</b> This team can effectively develop this company and handle the risks associated with the venture		
10	<b>Summary Financials</b> Consistent with plan and effective in capturing financial performance		
20	<b>Overall Viability &amp; Investment Potential</b> Market opportunity, distinctive competitive advantage, management understanding, and investment potential		
10	<b>Overall Professionalism &amp; Presentation Quality</b> Materials presented in clear, logical way; relate need for company with meaningful examples, practical applications; maintain judge's interest; understand judges' questions and respond with substantive answers; poise and confidence		

# TiEQuest 2008

Please fax the completed scoring sheet to 416 964 8517 on or before Tue, March 25, 2008 4:00 pm

## Business Plan Scoring Sheet

Name of the Judge: \_\_\_\_\_

Criteria	Max. Score	Score Awarded to Ventures				
		1	2	3	4	5
Name of Venture						
Entry #						
Would you consider investing in the venture?	25					
Product/Service (Value Proposition)	20					
Marketability (Sustainable Competitive Advantage)	20					
Viability/Feasibility	15					
Management (Track Record of the Team)	20					
Total Score	100					
Judges comments and suggestions						

### Judging Criteria

Would you invest in this company?

Product/Service:

Marketability:

Viability:



This is the key criteria. Judges will use intuitive judgment.

Does the venture have sound value proposition? Have contestants developed the product concept clearly? Does the business concept embody innovation and creativity?

Is the product/service marketable? Is there a demand? Is there sustainable competitive advantage?

What is the likelihood of the business plan actually becoming the basis for a viable business? Does the venture technically make sense? Could it be a real business? Will the venture be profitable? Have all the key financial considerations been taken into account in the projections? Does the return justify the investment and the risk?

Is the management knowledgeable, enthusiastic, and committed to the venture? Can they execute it? Do they have a track record?

## **Appendix C: Interview Sheets with Institutions**

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### **Organization**

Industrial Bank of Kuwait – Kuwait

Kuwait Small Projects Development Company – Kuwait

iPark – Jordan

Knowledge Oasis Muscat (KOM) – Sultanate of Oman

Mercury Technology Labs – Memphis – Tennessee

Technology Entrepreneurship Center – Kuwait

Center for Entrepreneurship and Innovation - University of Central Florida

Small Business Innovation Research (SBIR) - National Science Foundation (NSF) -  
Washington DC

**Interview Record Sheet****Date:** January 12<sup>th</sup> 2006**Location:** Industrial Bank of Kuwait**Department:** Handicraft and Small Enterprises**Interviewee:** Farah Al-Haroun**Title of Interviewee:** Financial Analyst and Evaluation Officer

**Overview:** *“The Handicraft and Small Enterprises Financing Portfolio, managed by the Industrial Bank of Kuwait on behalf of the Government of Kuwait, was established pursuant to the law No. 10 of 1998 for establishing a portfolio with a capital of K.D 50 million, for a period of 20 years, for financing Kuwait Handicraft and small Enterprises*

*Activities Finance:*

*Handicraft: any activity using handy or professional skills in which machines are not used extensively*

*Small Enterprises: Where the total invested amount does not exceed KD 500,000, and the purpose is:*

- (1) to convert raw material to semi / fully manufactured / intermediate products, or convert semi-manufactured / intermediate products into fully manufactured products,*
- (2) to provide maintenance / technical / professional / other services, or*
- (3) commercial enterprises or businesses.” (IBK 2006)*

*Source: <http://www.ibkuwt.com/en/handicraft-innerpage.htm> 12 Jan. 2006*

**Summary of Interview:**

Upon a discussion with Ms. Farah Al-Haroun it was established that there is a need for a method or a model that would be able to predict the success of a technological business venture during the funding stages. Moreover, Ms. Al-Haroun said that finding a way to measure the entrepreneurial nature of an applicant would be extremely helpful for evaluating proposal knowing there is someone to run it.

Ms. Al-Haroun said that the market, financials and the innovation are the most important elements that the bank focuses on. The term innovation in the context that was used by Ms. Al-Haroun did not include technological innovation. She was very firm in expressing that her department is uncomfortable about evaluating a technological business. She mentioned that technology is very tricky and unpredictable. She would prefer to have a separate evaluation technique.

**Summary of Interview continued:**

She mentioned that her department keeps record of feasibility studies. However, these are qualitative in nature and do not have a systematic approach. The evaluator performs a financial feasibility study and the department moves forward based on the results of this study.

**Interview Record Sheet**

**Date:** October 16 2006

**Location:** Kuwait Small Projects Development Company ( KSPDC)

**Department:** Project Evaluation Department

**Interviewee:** Fowzi Al-Mani

**Title of Interviewee:** Head of the Evaluation Office

**Overview:** *The Kuwait Small Projects Development Company (KSPDC) was established on December 18 1996, as a result of a parliament session and by the order of the Prime Minister, the Minister of Finance and the Chairman of the Investment Authority to set aside 100 Million KD (Kuwaiti Dinars) and to begin the establishment of the KSPDC.*

*The KSPDC primary goal was to promote economical growth in the funding of small businesses with promising ideas that are engaged with one of the following type of enterprises: 1) Industry, 2) Service companies, 3) Handicraft, and 4) commercial. Another goal was to promote the entrepreneurial spirit amongst Kuwaiti nationals and have them engaged with small and medium size business (KSPDC 2006)*

*Source: <http://www.kspdc.com/kspdc/aboutus.html>. 12 Oct. 2006*

**Summary of Interview:**

The conversation with Mr. Faowzi Al-Mani shed a light on the way the evaluation and monitoring of KSPDC programs takes place. With regard to the current process for evaluation, Mr. Al-Mani referred me to the site that has all the rules and regulations that an applicant needs to comply with if interested in requesting for funding for a business venture.

When asked if he thinks that the entrepreneurial ability should be considered when evaluating a business plan, his answer was “absolutely”. He also said yes when asked if he would be interested in using a method to predict the entrepreneurial ability of an applicant through a personality test.

When asked about the technological business ventures and the technological ideas that were presented and if I were able to take a look at any of those evaluation sheets, his said that the KSPDC refers all the technological business plans and ideas to the National Technology Enterprises Company, which specialized in evaluating technological business ventures. He felt that in the past technology-based enterprises needed a different evaluation and thus a special division or company should handle such applications.

**Interview Record Sheet**

**Date:** June 27 2007

**Location:** iPark – Jordan

**Interviewee:** Mr. Omar Hamarna

**Title of Interviewee:** Manager and Evaluator

**Overview:** *“iPark is a technology incubator that aims at providing the needed catalyst to fuel the entrepreneurial process that is pivotal to Jordan’s economic developments.*

*Source: <http://www.ipark.jo/>. 7 Jun. 2007*

**Summary of Interview:** Interviewing Mr. Omar Hamarna, manager and evaluator in iPark, was very helpful to understand the process of another technology park and begin to highlight the common elements that are being evaluated in technology parks when assessing a new technological venture.

Mr. Hamarna has been in his current position for the past five years and has evaluated over 100 technological business plans. The elements that iPark considers when evaluating a technological business venture are: People-Process, Financials, Product/Service and Market/opportunity.

Mr. Hamarna mentioned that they do use a form when they evaluate the technology and business plans. When asked to rank the importance of the following factors when evaluating a business plan on the scale of 1 – 5 (5 being very important) he answered as follows:

- The Person
- Technical ability [----2----]
  - Entrepreneurial ability [----5----]
- Technical Innovation
  - Intellectual Property [----3----]
  - Transfer Technology [----3----]
- The Market
  - Adoption level [----5----]
  - Global/Internal [----5----]
- The Organization
  - Description of the business [----2----]
  - Management Team [----5----]
  - Research Design/Development [----3----]
  - Operations [----4----]
  - Critical Risks [----4----]
  - Financials [----4----]
  - Milestones [----3----]

**Interview Record Sheet****Date:** July 11<sup>th</sup> 2007**Location:** Knowledge Oasis Muscat (KOM)**Department:** Knowledge Mine**Interviewee:** Mr. Dave Pender**Title of Interviewee:** Head of the Knowledge Mining / Incubation

**Overview:** *“Dedicated to supporting technology-oriented businesses, KOM brings together a diversity of enterprises from industry niches as varied as M-commerce to international call centers. KOM is home to blue-chips such as Oracle, Hewlett Packard, Motorola, Microsoft, NCR, and Huawei as well as dynamic hi-tech start-ups.”*

*“ The Knowledge Mine in KOM is looking for people that have the potential to produce commercially feasible products or services that will create jobs and foster other business opportunities”*

*“To be eligible, a company must  
- Be a start-up or early stage Internet, infrastructure, wireless, telecommunications, multimedia, networking, software, digital media, or business process automation business.”*

*Source: [http://www.kom.om/index9406.html?lang=en&sub=about\\_kom](http://www.kom.om/index9406.html?lang=en&sub=about_kom) 3 Apr. 2007*

**Summary of Interview:**

Meeting with Mr. Dave Pender was very helpful to understand his company’s evaluation techniques. The applicants are reviewed based on the following criteria:

The strength of the technology or innovation, the quality of the business plan, business and market potential, management team, and the potential of contribution to the KOM community.

Mr. Pender mentioned that KOM is a young technology park. Since opening, it has had 12 applicants, with four rejected and eight accepted. The way these technology businesses were evaluated was based on a presentation that the founders of the businesses made in front of a panel of judges/evaluators. He mentioned that the evaluators had to keep in mind the above-mentioned criteria when they were reviewing each presentation.

He mentioned that they had an evaluation sheet that guided the judges not did (does not make sense—something is missing here)each technology was also evaluated based on a

sheet where they would have kept record of the technologies or applicants for future references.

He welcomed the idea of evaluation sheets and performing an entrepreneurial test of a personality, which would profile a person into a category. He mentioned that from the ones they incubated, it is obvious that the applicants are very competent in their subject matter, however, There is no way for them to know if they are entrepreneurial. He said “it would be nice to know ahead of time if a person has entrepreneurial ability.”

Mr. Pender mentioned that he would be able to use our sheets and have independent evaluators assess these incubations to see what they would get as a score.

**Interview Record Sheet****Date:** May 12 2007**Location:** Mercury Technology Labs, Memphis, Tennessee**Interviewee:** Mr. Eric Mathews**Title of Interviewee:** Founder and General Partner

**Overview:** *“Mercury Technology Labs is an innovation connector and venture creation company operating from Memphis, Tennessee. Mercury Technology Labs fulfills these two critical roles in the innovation economy by embracing principles of open innovation and innovation acceleration. Mercury strategically partners with corporate research and development engines to evaluate their intellectual property and provide external commercialization support as part of a framework for open innovation. Furthermore, Mercury finds the best raw technologies and research talent from research and development labs both academic and industrial, invests management expertise and capital, and creates new technology ventures. Mercury Technology Labs is tapping the opportunity of technological intellectual capital and providing value as an innovation engine.”*

*Source: <http://www.mercurytechlabs.com/people.html> 16 May 2007*

**Summary of Interview:** Eric Mathews, founder and general partner of Mercury Technology Labs, welcomed the research, adding that “this topic is very close to my heart.” I found out how much he values technology and entrepreneurship.

Mr. Mathews mentioned that they evaluate technological companies based on two criteria: the technological innovation and the business concept. He said that “it would be great if we were able to give the founders a personality test and are able to predict if they were entrepreneurial.”

Mr. Mathews mentioned that they are a young company, “a start-up that funds start-ups.” He mentioned that the FedEx Institute of Technology holds a business plan competition and that because he used to work there in the past, he was asked to run the 2007 business plan competition for them.

He also agreed to help in the research in any way he can. He promised to get me permission to attend the business plan and also observe the due-diligence that takes place in the competition. Moreover, Mr. Mathews was willing to participate in this research by providing me with data that I would need for my research: technical evaluations scores, business evaluation scores and also by getting in touch with the founders to have them fill out questionnaires and take personality tests.

**Interview Record Sheet****Date:** November 24 2006**Location:** National Technology Enterprises Company**Department:** Technology Entrepreneurship Center (TEC)**Interviewee:** Dr. Adnan Al-Sultan**Title of Interviewee:** Chairman and Managing Director

**Overview:** *“Technology Entrepreneurship Center (TEC) is an independent entity of the National Technology Enterprises Company (NTEC) that has been established in collaboration with the Massachusetts Institute of Technology (MIT) Entrepreneurship Center, USA. TEC supports local business activity by identifying and nurturing technology ideas and fostering Entrepreneurship.*

*TEC is an intersecting point for entrepreneurs, venture capitalists, students, scientists, academics, and government, and industry, forming a venture support system for aspiring entrepreneurs.*

*TEC achieves its objectives of establishing Kuwait as a regional leader in new product and venture development through a multi-disciplinary approach that includes:*

- Running Business Plan Competitions on a regular basis*
- Providing seed money for technology startups in Kuwait” (NTEC 2006)*

*Source: <http://www.ntec.com.kw/tec/> 25 Nov. 2006*

**Summary of Interview:**

The conference call was with Dr. Adnan Al-Sultan, chairman and managing director, who has 21 years of experience in managing investment companies and also in academia and consulting. Dr. Al-Sultan provided a lot of information and was helpful in talking about the process and elements that they look for when evaluating a technology based business venture. He believed that “technology today is very important and technology based companies can be big contributors to the health of the economy”.

He stressed that technology based companies need to be evaluated differently than non-technical companies. The first step in the process of the submission of an idea is to evaluate whether it is considered technical or non-technical. Once an idea passes as a technical idea then the evaluation of the technology will take place. If the technology proves to be feasible then an evaluation of the business plan will take place and if it is approved then the technology business venture will get incubated.

Dr. Al-Sultan mentioned that once a technology venture is incubated they begin to pay a closer attention to the founder. If the founder was more “technical in nature” then they will recommend that he holds the position of CIO and not the CEO. He said that they are aware that most people that apply to them are what he called “techis” and it is important that we recognize and mention to them that they may not be entrepreneurial. Moreover, when asked how they assess the founder, he replied “by his or her experience”

Dr. Al-Sultan also mentioned that they were more than happy to help in anyway they can. He mentioned that they have kept a record of all their applicants and all of their evaluation sheets. He would be more than happy to provide me with all the data that I may need for this project and all sample forms that their participants use can be found on their website. Their sample evaluation sheets will also be provided to me to get a sense of how they evaluate their technologies.

The conference call concluded with a decision to meet in person at a later time when I am in Kuwait and they would provide me with everything that I might need.

**Interview Record Sheet**

**Date:** May 25 2007

**Location:** National Technology Enterprises Company

**Department:** Technology Entrepreneurship Center (TEC)

**Interviewee:** Mr. Anas Meerza

**Title of Interviewee:** Head of the Evaluation Department

**Overview:** *“Technology Entrepreneurship Center (TEC) is an independent entity of the National Technology Enterprises Company (NTEC) that has been established in collaboration with the Massachusetts Institute of Technology (MIT) Entrepreneurship Center, USA. TEC supports local business activity by identifying and nurturing technology ideas and fostering Entrepreneurship.*

*TEC is an intersecting point for entrepreneurs, venture capitalists, students, scientists, academics, and government, and industry, forming a venture support system for aspiring entrepreneurs.*

*TEC achieves its objectives of establishing Kuwait as a regional leader in new product and venture development through a multi-disciplinary approach that includes:*

- Running Business Plan Competitions on a regular basis*
- Providing seed money for technology startups in Kuwait” (NTEC 2006)*

*Source: <http://www.ntec.com.kw/tec/> 25 Nov. 2006*

**Summary of Interview:**

Meeting with Mr. Anas Meerza allowed me to see how TEC functions first hand. It was very useful to be able to see how they conduct their business and also meet some evaluators and get the chance to speak to them.

Mr. Meerza walked me through their process and also gave me copies of their evaluation sheets (both the technology evaluation sheets and the business plan evaluation sheets). He also provided me with the list of applicants that participated in submitting a business plan to TEC. Moreover, he provided me with the list of evaluators that they get help from in order to get a feel of the evaluator’s background and their industry experience.

Mr. Meerza mentioned that TEC has many applicants and promising inventors and also mentioned that they consider the entrepreneurial ability of applicants. He mentioned that they have an entrepreneurial test that they like to give their participants to see what they would score. He felt that it was a straight-forward test.

## **Interview Record Sheet**

**Date:** November 4 2007

**Location:** University of Central Florida

**Department:** Center of Entrepreneurship and Innovation

**Interviewee:** Dr. Cameron Ford

**Title of Interviewee:** Founding Director, Center of Entrepreneurship and Innovation

**Overview:** *“CEI fosters the notion that "UCF Stands for Opportunity" by working with a network of university, business, and government partners to promote new venture creation, economic development and a better quality of life throughout the region.”*

*Source: <http://www.cei.ucf.edu/about/index.html> 16 Oct. 2007*

### **Summary of Interview:**

The University of Central Florida in partnership with the National Collegiate Inventors and Innovators Alliance were holding a *Invention to Venture* workshops in technology entrepreneurship that I was going to attend. I held a phone interview with Dr. Ford about the center and how they promote entrepreneurship among the student body and faculty. He mentioned than other than providing classes and offering workshops they also hold competitions to enhance the entrepreneurial spirit in UCF.

Dr. Ford mentioned that last year they had their first Sunshine State Venture Challenge, which is a business plan competition that takes place in amongst a number of universities in Florida.

He said that in about two weeks they will be holding the second Sunshine State Venture Challenge. He mentioned that this year they are better prepared and that they did not save any data from the previous business plan. He added that, after last year's competition he kept all the paperwork in a box in the trunk of his car and could not remember what happened to it.

When asked about the evaluation sheets and the type of business ventures that would be competing, he mentioned that not all of the business plans are technology related. They do however have two tracks: capital intensive and limited investment. The judges of the competition do not evaluate the non-technical and the technical business plans differently from each other.

At the end of the interview we agreed that I would use the competition as a source of data.

**Interview Record Sheet**

**Date:** October 12 2007

**Location:** National Science Foundation

**Department:** Small Business Innovation Research (SBIR)

**Interviewee:** Errol B. Arkilic

**Title of Interviewee:** Information Technology Program Officer.

**Overview:** *“The National Science Foundation (NSF) Small Business Innovation Research (SBIR) Program provides early stage funds to small businesses to conduct research and development, and to prototype exemplary innovative technologies with strong market potential. The NSF- SBIR Projects cover a broad range of topics in advanced materials and manufacturing, biotechnology, electronic, and information technology.”*

*Source: <http://www.nsf.gov/eng/iip/sbir/matchmaker.jsp> 12 Oct. 2007*

**Summary of Interview:**

Mr. Arkilic mentioned that their department only evaluates and funds technological start-ups. They get a variety of technological innovations and ventures. They get evaluators to look at the proposal (business concept), who must consider the following areas: (1) the team (2) the market (3) the technology (4) and finance.

The department does not have numerical scores for those areas, only strengths and weaknesses prepared by the evaluator. They do not rank the applicants they simply accept or reject projects. An oral discussion/evaluation of the strengths and weaknesses takes place in order for a group of evaluators to reach a decision.

Following are the questions that must be considered when evaluating. These are extracted from the commercial evaluation form used by the NSF.

**“Market Opportunity**

*Has the company succinctly described the market opportunity?*

*Does there appear to be an adequate market opportunity to justify a Phase I feasibility effort?*

*Have they demonstrated an understanding of a typical customer profile?*

*Has the company described the product or service and the “customer needs” which are being addressed?*

*Can you tell where they are in the development cycle?  
Does this appear to be an innovation that can get to market within three years?*

### **Company/Team**

*Based on the information in the proposal, is this a seed, early stage or expanding company?*

*How well is the team poised to take this innovation to market?*

*Have they taken similar products to market previously?*

*Do they have additional outside advisors, mentors, partners and stakeholders?*

*Is the corporate structure consistent with the company's stage and vision?*

### **Product/Technology and Competition**

*Has the company described the features of their product or service that are going to provide a compelling value proposition to the customer?*

*What validation is there from the market about the proposed value proposition?*

*Does the company demonstrate knowledge of the competitive landscape?*

*How is this company going to compete: price, performance or other?*

*Does the company appear to understand issues regarding IP?*

*Is there adequate evidence that the company knows its position in the IP landscape?*

*Does there appear to be a management plan for handling IP issues as they arise?*

### **Revenue and Finance Plan**

*Does the company demonstrate adequate knowledge for the level of financial resources it will take to get the innovation to market?*

*Does there appear to be a plan to bring reasonable resources to bear to take this innovation to market?"*

Source: [www.nsf.gov/eng/iip/sbir/commercialreviewform.doc](http://www.nsf.gov/eng/iip/sbir/commercialreviewform.doc) 12 Oct. 2007

## Appendix D: Jung, Myers-Briggs and Keirsey Description of Types

Source: [www.businessballs.com](http://www.businessballs.com)

Jung's four functional types – descriptions

<div style="display: flex; justify-content: space-around; border: 1px solid black; padding: 5px;"> <div style="border: 1px solid black; padding: 5px; background-color: #e0e0e0;"><b>Extraverted</b></div> <div style="border: 1px solid black; padding: 5px; background-color: #a0a0a0;"><b>Introverted</b></div> </div>		
<b>Thinking</b>	Jung's 'Thinking' function is a 'rational' process of understanding reality, implications, causes and effects in a logical and analytical way. It is systematic, evaluates truth, and is objective to the extent that evaluation is based on personal intelligence and comprehension. 'Thinking' is the opposite to 'Feeling'.	<b>judging</b>  (Jung's 'rational' functions)
<b>Feeling</b>	Jung's 'Feeling' function makes judgments on a personal subjective basis. It is a 'rational' process of forming personal subjective opinion about whether something is good or bad, right or wrong, acceptable or unacceptable, etc., and involves sentimentality and humanity. 'Feeling' is the opposite to 'Thinking'.	
<b>Sensation</b>	Jung's 'Sensation' function translates signals from the senses into factual data. There is no judgement of right or wrong, good or bad, implications, causes, directions, context, possibilities, themes, or related concepts. Sensation sees what is, as what it is. 'Sensation' is the opposite to 'Intuition'.	<b>perceiving</b>  (Jung's 'irrational' functions)
<b>Intuition</b>	Jung's 'Intuition' function translates things, facts and details into larger conceptual pictures, possibilities, opportunities, imaginings, mysticism and new ideas. Intuition largely ignores essential facts and details, logic and truth. 'Intuition' is the opposite to 'Sensation'.	

## Myers- Briggs theory and the MBTI model

one's own action and effect on it	<b>(E) Extraversion</b>	Or	<b>Introversion (I)</b>	preference for inner self and ideas to understand and protect or nurture it
Gathers information by: focusing on facts within information	<b>(S) Sensing</b>	Or	<b>iNtuition (N)</b>	Gathers information by: interpreting patterns, possibilities and meaning from information received
decides by using logic, consistency, objective analysis, process-driven conclusions	<b>(T) Thinking</b>	Or	<b>Feeling (F)</b>	Decides according to what matters to self and others, and personal values
in dealing with the world organizes, plans, controls, and decides clear firm actions and responses - relatively quick to decide	<b>(J) Judging</b>	Or	<b>Perceiving (P)</b>	in dealing with the world responds and acts with flexibility, spontaneity, adaptability and understanding - relatively slow to decide

The MBTI 'Type Table' related to Four Temperaments/Keirsey groupings

<b>SP - sensing perceiving</b>	<b>SJ - sensing judging</b>	<b>NF - intuitive feeling</b>	<b>NT - intuitive thinking</b>
<b>ESTP</b>	<b>ESTJ</b>	<b>ENFJ</b>	<b>ENTJ</b>
<b>ISTP</b>	<b>ISTJ</b>	<b>INFJ</b>	<b>INTJ</b>
<b>ESFP</b>	<b>ESFJ</b>	<b>ENFP</b>	<b>ENTP</b>
<b>ISFP</b>	<b>ISFJ</b>	<b>INFP</b>	<b>INTP</b>
<b>sanguine or artisan</b>	<b>melancholic or guardian</b>	<b>choleric or idealist</b>	<b>phlegmatic or rationalist</b>

## Appendix E: Solicitation Letters

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TO: -----  
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Subject: Research Assistant

Dear Sir/Madam

My name is Abeer Al-Hassan Abbas, a PhD student at George Mason University in the US. I am working on my dissertation in Information Technology. My area of interest is Technical Entrepreneurship. I am at the stage in my research of testing my hypothesis. The intent of my research is to develop an assessment methodology/model to predict the success of technological enterprises. This model concentrates on three elements: the technological innovation, the business concept and the person.

In order to run tests on the model that I am developing I need to gather data that would be used in this study. I believe that your institution is a custom fit knowledge base that would be vital for my research. I feel that we both have the same goal, which is advancing human and social development through the use of technological advancement, promoting private enterprise and supporting economic growth.

I would be grateful if you could kindly refer me to a person or department that is in charge of evaluating technological innovation or business concepts. I need to conduct interviews and request some information for my dissertation. Any propriety information that I will use (with your permission) will be acknowledged and cited in my research. I am willing to sign a non-disclosure agreement if you find it necessary.

Thank you very much, in advance, for your kind assistance. Your feedback and help would be highly appreciated.

Sincerely,

Abeer Al-Hassan Abbas  
Doctoral Candidate  
Volgenau School of Information Technology and Engineering  
George Mason University

Sharon deMonsabert  
Associate Professor  
Volgenau School of Information Technology and Engineering  
George Mason University

**Dear Sir/Madam**

My name is Abeer Al-Hassan Abbas and I am a PhD student at George Mason University. The intent of my research is to develop an assessment methodology/model to predict the success of new technical start-ups. This model focuses on the following three elements: the business plan, the innovation, and the entrepreneur.

My research benefits from a diversity of business plan data. In the past year I have received the support of several business plan competitions and entrepreneurial centers across the region and overseas including: the FedEx Technology Institute, Memphis, TN; the Technical Entrepreneurship Center, Kuwait; the Small Business Administration, Kuwait; and the Knowledge Oasis Muscat, Oman; Sunshine State Venture Challenge, University of Central Florida; Moot Corp, University of Texas at Austin; iPark Jordan;

The model that I am developing evaluates new business ventures based on technical criteria, soundness of the business plan and the founder's entrepreneurial ability. The model is statistically based and benefits from a broad database. Would you be willing to assist in my data collection effort? I am looking for past scores of business plan competitions, rankings and founder information. I do not need any of the proprietary information of the business concept. My research lies in the evaluation process as opposed to the technical and/or business advantage of the new venture.

Any data that I receive will be strictly confidential. My research plan has been approved by the Human Subject Review Board of George Mason University (HSRB). The HSRB's goal is to insure and protect the right of all the subjects that participate.

In exchange for your participation, I would be more than happy to acknowledge your business plan competition in my thesis and all published papers that may result from this research effort. Additionally, the results of the research will be made available to your organization.

I hope to hear from you regarding your willingness to participate.

Sincerely,

Abeer Al-Hassan Abbas  
Doctoral Candidate  
Volgenau School of Information Technology and Engineering  
George Mason University

Sharon deMonsabert  
Associate Professor  
Volgenau School of Information Technology and Engineering  
George Mason University

Dear .....

About a month ago you were emailed the following request. I am writing to you again because your participation is still very important. I am towards the end of my dissertation and your help can help in the conclusion of my study. **Mr. Suresh Madan, CFA and Chair of TiEQuest**, was kind to mention that all the participants in this year's business plan competition were of an extremely high caliber but unfortunately elimination is inevitable due to the nature of the competition.

As mentioned in the previous e-mail, that I am a PhD student in the final stage of my thesis to validate a model that I have been working on, "Assessment Methodology for Predicting the Success of Technological Enterprises". This model focuses on the Early Stage Success – the funding phase.

I am using the "**TiEQuest 2008 Business Venture Competition**" as a source of data. Mr. Madan has been very helpful in allowing me this opportunity to validate my model using data from this year's business plan competition. I would like to assure you that I have no access to any proprietary information such as your business plan as it is of complete confidentiality. All I have is your contact information and your company's name.

Your participation is completely voluntary and the information you submit to me is completely confidential and will not be used other than for my thesis (I attach a consent form for you in case you would like one – this is for you to keep). On a more personal note, I would like you to know that collecting data for a PhD dissertation is extremely challenging. It is also very rare to find the right sample such as yourself.

I kindly ask for your assistance in participating in (1) filling out the attached questionnaire, which would serve to link you to the type of business you are proposing and also gives me some background to your skills since I have no access to your business plans; (2) taking a short personality exam to allow me to test my hypothesis as I am studying personalities such as yourself that moved forward with an idea and created a business plan. I will be more than happy to e-mail you a description of your personality type should you choose to participate.

I would like to stress that there are no right/wrong or good/bad answers in this research. The answers to the questionnaires will help me in gathering some of the characteristics about entrepreneurs like you.

Thank you very much for your time and effort

**Best of luck with your quest!**

Abeer Al-Hassan Abbas  
Doctoral Candidate  
Volgenau School of Information Technology and Engineering  
George Mason University

Sharon deMonsabert  
Associate Professor  
Volgenau School of Information Technology and Engineering  
George Mason University

## **Appendix F: Structured Interviews**

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This instrument was used to collect information during the interview and observation phase of this research.

**Interview Questions:**

1. How long have you evaluated business plans?
2. How many business plans have you evaluated in this time?
3. What criteria are used?
4. Do you use a form to complete your evaluation? Please attach a copy, if possible.
5. What type of business plans do you evaluate? (check all that apply)

- |   |  |
|---|--|
| <input type="checkbox"/> Electronics, Microelectronic | <input type="checkbox"/> Information Processing    |
| <input type="checkbox"/> Information Systems          | <input type="checkbox"/> Sound Engineering         |
| <input type="checkbox"/> IT and Software Applications | <input type="checkbox"/> Multimedia                |
| <input type="checkbox"/> Telecommunications           | <input type="checkbox"/> Networking                |
| <input type="checkbox"/> Industrial Manufacturing     | <input type="checkbox"/> Process Control           |
| <input type="checkbox"/> IT Maintenance               | <input type="checkbox"/> Construction Technology   |
| <input type="checkbox"/> Material Technology          | <input type="checkbox"/> Shipping Technology       |
| <input type="checkbox"/> Aerospace Technology         | <input type="checkbox"/> Process Plant Engineering |
| <input type="checkbox"/> Chemical Engineering         | <input type="checkbox"/> Textile Technology        |
| <input type="checkbox"/> Leather Technology           |  |
| <input type="checkbox"/> Other (please specify)       |  |

.....

6. Rank the importance of the following factors when evaluating a business plan on the scale of 1 – 5 (with 1 being the most important?).

- The Person
  - Technical ability [-----]
  - Entrepreneurial ability [-----]
  
- Technical Innovation
  - Intellectual property (patentable) [-----]
  - Technology transfer (not original) [-----]
  
- The Market
  - Adoption level [-----]
  - Global/Internal [-----]
  
- The Organization
  - Description of the business [-----]
  - Management team [-----]
  - Research design/development [-----]
  - Operations [-----]
  - Critical Risks [-----]

- Financials [-----]
- Milestones [-----]

- The Social elements
  - Cultural [-----]
  - Religious [-----]
  - Language [-----]

7. Do you feel that technology related businesses should be evaluated differently from non-technology businesses? Why?
8. Do you feel that a technological business plan should pay more attention to the person's credentials than a non-technical business?
9. If you were to change anything in the way your department evaluates business plans, what would you change?
10. Do you keep track of previously funded business plans?
11. Do you feel that some business plans were poorly written but you thought that with some fine tuning this business plan would have been funded ?
12. What is the most common reason for rejecting a business plan?
13. Do you have any questions or comments?

## الاستفتاء

1. متى بدأت تقييم خطط العمل؟
2. ما هو العدد التقريبي الذي قيمته؟
3. ما هي المعايير التي أُسْتُخْدِمَتْ؟
4. هل تستخدم استمارةً لإكمال تقييمك؟ (ألحق نسخة رجاء)
5. أي نوع من خطط العمل تقيّم؟ (اختر كل ما ينطبق)

- إلكترونيات, ماكروإلكتروك
- أنظمة المعلومات
- ادارة معالجة المعلومات
- وسائط الصوت والصورة
- تقنية المعلومات و تطبيقات البرامج
- الاتصالات بشكل سلكي ولاسلكي
- شبكة مَعْلُومَات
- تصنيع صناعي
- تحكم العمليات
- صيانة تقنية المعلومات
- هندسة البناء
- تقنية مادية
- تقية الشحن
- تقنية المناخ
- هندسة زراعية
- هندسة كيميائية
- تكنولوجيا النسيج
- التكنولوجيا الجلدية
- هندسة الصوت
- خطط اخرى لم تذكر -----

6. صنّف أهميّة العوامل الخمسة التالية (1\_5) من 5 الاهم الى 1 الاقل اهمية.  
ملاحظة : العوامل الفرعية هي فقط للتوضيح .

## ا. الشّخص \_\_\_\_\_

- قدرة تقنيّة
- قدرة المبادره

## اا. ابتكار تقنيّ \_\_\_\_\_

- الملكيّة الفكرية
- استيراد التكنولوجيا

## ااا. السّوق \_\_\_\_\_

- مستوى التّبيّي
- عالميّ / داخليّ

## اااا. المنظّمة \_\_\_\_\_

- طبيعة العمل
- فريق الإدارة
- تصميم البحوث والتنمية
- تسيير العمل
- المراحل الحرجة
- الجدوله الماليه
- المراحل الهامة

## ااااا. العناصر الاجتماعيّة \_\_\_\_\_

- ثقافيّة
- دينية
- لغوية

7. هل تشعر بأن الأعمال المتعلقة بالتكنولوجيا يجب أن تُقيّم بخلاف عن الأعمال الغير تكنولوجيه ؟ ولماذا ؟

8. هل تشعر أن خطة العمل ا لتكنولوجية ينبغي أن تركّز انتباه أكثر على أوراق اعتماد الشخص بخلاف الاعمال الاخرى؟
9. في رأيك هل يوجد طرق تقييمية اخرى تود ان تقترحها ؟
10. هل تتابع خطط عمل مولت سابقاً؟
11. هل تشعر أن بعض خطط العمل كانت مكتوبة بصورة رديئة لكنك اعتقدت أن ببعض التعديلات على الخطة تصبح صالحة للتمويل؟
12. ما هو أشيع سبب لرفض خطة عمل ؟
13. هل لديك أسئلة أو تعليقات ؟

## Appendix G: Sample of Blind Table

---

Code	Tech Value	Biz Value	MBTI	Myers Briggs Percentages	Is Questionnaire attached?
CGX	7/10	80/100	Founder 1 ESTJ	Cgx Founder 1 Extroverted (E) 51.28% Introverted (I) 48.72% Sensing (S) 57.58% Intuitive (N) 42.42% Thinking (T) 56.1% Feeling (F) 43.9% Judging (J) 58.33% Perceiving (P) 41.67%	Yes cgx founder 1
Learning	7/10	80/100	Founder 1 ENTJ		Yes learning founder 1
Share	2/10	80/100	INTJ	Introverted (I) 51.61% Extroverted (E) 48.39% Intuitive (N) 58.06% Sensing (S) 41.94% Thinking (T) 72.73% Feeling (F) 27.27% Judging (J) 61.29% Perceiving (P) 38.71%	Yes attached share
Light	7/10	70/100	ENTJ	Extroverted (E) 55.88% Introverted (I) 44.12% Intuitive (N) 55.26% Sensing (S) 44.74% Thinking (T) 59.46% Feeling (F) 40.54% Judging (J) 58.97% Perceiving (P) 41.03%	Light

## **Appendix H: Questionnaire for Participants Participating in Business Plan Competition**

---

This instrument was used to collect information from business plan participants

**Questionnaire to persons submitting a business plan:**

1. What is your educational background?  
-----
2. What is/are your highest attained degree (s) and in what field?  
-----  
-----
3. How long did you work in that field? -----
4. What is your current position? -----
5. How long have you been in this position? -----
6. What are some functions that you did for this position?  
-----  
-----
7. Do you have technical experience?  
Yes [----] No [----] If yes, how long? -----
8. Do you have experience in business management?  
Yes [----] No [----] If yes, how long? -----
9. How do you rate your technical/scientific background (1 – 10)? 10 being very technical. [-----]
10. What is your product or service? (check all that apply)
  - Electronics, Microelectronic
  - Information Systems
  - IT and Software Applications
  - Telecommunications
  - Industrial Manufacturing
  - IT Maintenance
  - Material Technology
  - Aerospace Technology
  - Chemical Engineering
  - Leather Technology
  - Other (please specify)  
.....
  - Information Processing
  - Sound Engineering
  - Multimedia
  - Networking
  - Process Control
  - Construction Technology
  - Shipping Technology
  - Process Plant Engineering
  - Textile Technology
11. Have you ever owned a company? Yes [-----] No [-----]  
If yes, for how many years? [-----]  
Do you believe it was successful? [-----]
12. Did your parents own a company? Yes [-----] No [-----]  
If yes, for how many years? [-----]  
Do you believe it was successful? [-----]

الاستفتاء إلى الأشخاص الذين يعرضون خطة العمل :

1. ما هو مستواك التعليمي ؟
2. ما هي درجتك العلمية و في ماذا ؟
3. إلى متى عملت في ذلك الحقل ؟
4. ما هو منصبك الحالي ؟
5. كم بقيت في هذا المنصب ؟
6. ما هي بعض الوظائف التي كلفت بها في هذا المنصب ؟
7. هل لديك خبرة التقنية ؟  
نعم [ - - - - ] لا [ - - - - ] إذا نعم إلى متى - - - - -
8. هل لديك خبرة في تدبير الأعمال ؟  
نعم [ - - - - ] لا [ - - - - ] إذا نعم إلى متى - - - - -
9. كيف تقيم خلفيتك التقنية الخاصة بك ( 1 - 10 ) ؟  
حيث 10 تقني جداً
10. ما هو منتجك أو الخدمة ؟ ( اختار كل ما ينطبق )

- إلكترونيات , ماكروإليكترونك
- أنظمة المعلومات
- ادارة معالجة المعلومات
- وسائط الصوت والصورة
- تقنية المعلومات و تطبيقات البرامج
- الاتصالات بشكل سلكي ولاسلكي
- شبكَة مَعْلُومَات
- تصنيع صناعي
- تحكم العمليات
- صيانة تقنية المعلومات
- هندسة البناء
- تقنية مادية
- تقيه الشحن
- تقنية المناخ
- هندسة زراعية
- هندسة كيميائية
- تكنولوجيا النسيج
- التكنولوجيا الجلدية
- هندسة الصوت
- اخرى لم تذكر -----

11. هل امتلكت في أيّ وقت شركة؟ نعم [ - - - - ] لا [ - - - - ]  
 إذا نعم، كمّ سنه؟ [ - - - - ]  
 هل تعتقد أنّها كانت ناجحه [ - - - - ]
12. هل امتلك أبائك شركة؟ نعم [ - - - - ] لا [ - - - - ]  
 إذا نعم، كمّ سنه [ - - - - ]  
 هل تعتقد أنّها كانت ناجحه [ - - - - ]

## Appendix I: SPSS Results

---

This section displays the results that were compiled from the SPSS analyses

### **Model 1**

Data Series: 1000, 2000, 3000, 4000

Regression through the origin

Dependent Variable: Rank

Independent Variables: Technical, Business, Extroverted, iNtuitive, Thinking, Judging

Results:

**Variables Entered/Removed(b,c)**

Model	Variables Entered	Variables Removed	Method
1	Judging, iNtuitive, Extroverted, Business, Thinking, Technical (a)		Enter

- a All requested variables entered.
- b Dependent Variable: Rank
- c Linear Regression through the Origin

**Model Summary**

Model	R	R Square(a)	Adjusted R Square	Std. Error of the Estimate
1	.977(b)	.955	.936	.16837

- a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
- b Predictors: Judging, iNtuitive, Extroverted, Business, Thinking, Technical

**ANOVA(c,d)**

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	8.405	6	1.401	49.419	.000(a)
	Residual	.397	14	.028		
	Total	8.802(b)	20			

- a Predictors: Judging, iNtuitive, Extroverted, Business, Thinking, Technical
- b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.
- c Dependent Variable: Rank
- d Linear Regression through the Origin

**Coefficients(a,b)**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
1	Technical	.542	.696	.584	.778	.449
	Business	.364	.734	.403	.496	.627
	Extroverted	.184	.348	.153	.530	.605
	iNtuitive	.512	.390	.385	1.313	.210
	Thinking	-.652	.527	-.582	-1.237	.237
	Judging	.042	.496	.034	.084	.934

- a Dependent Variable: Rank
- b Linear Regression through the Origin

## Model 2

Data Series: 1000, 2000, 3000, 4000

Regression through the origin

Dependent Variable: Rank

Independent Variables: Technical, Business, PValue

**Variables Entered/Removed(b,c)**

Model	Variables Entered	Variables Removed	Method
2	PValue, Technical, Business(a)	.	Enter

- a All requested variables entered.
- b Dependent Variable: Rank
- c Linear Regression through the Origin

**Model Summary**

Model	R	R Square(a)	Adjusted R Square	Std. Error of the Estimate
2	.972(b)	.945	.939	.15633

- a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.
- b Predictors: PValue, Technical, Business

**ANOVA(c,d)**

Model		Sum of Squares	Df	Mean Square	F	Sig.
2	Regression	10.585	3	3.528	144.388	.000(a)
	Residual	.611	25	.024		
	Total	11.196(b)	28			

- a Predictors: PValue, Technical, Business
- b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.
- c Dependent Variable: Rank
- d Linear Regression through the Origin

**Coefficients(a,b)**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
2	Technical	.736	.198	.809	3.724	.001
	Business	.141	.209	.160	.675	.506
	PValue	.006	.097	.007	.058	.954

- a Dependent Variable: Rank
- b Linear Regression through the Origin

**Model 3**

Data Series: 1000, 2000, 3000, 4000

Regression through the origin

Dependent Variable: Rank

Independent Variables: Technical, Business, I50, N50, T50, P50

**Variables Entered/Removed(b,c)**

Model	Variables Entered	Variables Removed	Method
3	P50, I50, Technical, N50, T50, Business(a)		Enter

- a All requested variables entered.  
 b Dependent Variable: Rank  
 c Linear Regression through the Origin

**Model Summary**

Model	R	R Square(a)	Adjusted R Square	Std. Error of the Estimate
3	.978(b)	.957	.945	.14770

- a For regression through the origin (the no-intercept model), R Square measures the proportion of the variability in the dependent variable about the origin explained by regression. This CANNOT be compared to R Square for models which include an intercept.  
 b Predictors: P50, I50, Technical, N50, T50, Business

**ANOVA(c,d)**

Model		Sum of Squares	Df	Mean Square	F	Sig.
3	Regression	10.716	6	1.786	81.875	.000(a)
	Residual	.480	22	.022		
	Total	11.196(b)	28			

- a Predictors: P50, I50, Technical, N50, T50, Business  
 b This total sum of squares is not corrected for the constant because the constant is zero for regression through the origin.  
 c Dependent Variable: Rank  
 d Linear Regression through the Origin

**Coefficients(a,b)**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	B	Std. Error
3	Technical	.739	.199	.813	3.721	.001
	Business	.207	.217	.234	.955	.350
	I50	-.101	.262	-.019	-.384	.705
	N50	.552	.349	.081	1.579	.129
	T50	-.529	.453	-.095	-1.167	.256
	P50	-.088	.355	-.014	-.247	.807

- a Dependent Variable: Rank  
 b Linear Regression through the Origin

# Pearson Correlations

## Correlations

		Technical	Business	E50	N50	T50	J50	Rank	PValue
Technical	Pearson Correlation	1	.346	-.077	-.144	-.197	-.086	.664(**)	-.240
	Sig. (2-tailed)		.071	.698	.465	.316	.664	.000	.220
	N	28	28	28	28	28	28	28	28
Business	Pearson Correlation	.346	1	.027	.007	.114	-.092	.384(*)	-.382(*)
	Sig. (2-tailed)	.071		.892	.972	.564	.643	.043	.045
	N	28	28	28	28	28	28	28	28
E50	Pearson Correlation	-.077	.027	1	.069	-.273	.059	.092	-.496(**)
	Sig. (2-tailed)	.698	.892		.728	.159	.767	.641	.007
	N	28	28	28	28	28	28	28	28
N50	Pearson Correlation	-.144	.007	.069	1	-.179	-.471(*)	.192	.182
	Sig. (2-tailed)	.465	.972	.728		.363	.011	.328	.353
	N	28	28	28	28	28	28	28	28
T50	Pearson Correlation	-.197	.114	-.273	-.179	1	.283	-.323	.240
	Sig. (2-tailed)	.316	.564	.159	.363		.144	.094	.219
	N	28	28	28	28	28	28	28	28
J50	Pearson Correlation	-.086	-.092	.059	-.471(*)	.283	1	-.183	-.018
	Sig. (2-tailed)	.664	.643	.767	.011	.144		.351	.926
	N	28	28	28	28	28	28	28	28
Rank	Pearson Correlation	.664(**)	.384(*)	.092	.192	-.323	-.183	1	-.110
	Sig. (2-tailed)	.000	.043	.641	.328	.094	.351		.579
	N	28	28	28	28	28	28	28	28
PValue	Pearson Correlation	-.240	-.382(*)	-.496(**)	.182	.240	-.018	-.110	1
	Sig. (2-tailed)	.220	.045	.007	.353	.219	.926	.579	
	N	28	28	28	28	28	28	28	28

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

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

### Model 4

Data Series: 1000, 2000, 3000, 4000

Simple linear regression

Dependent Variable: Rank

Independent Variables: Technical

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
4	.664(a)	.440	.419	.15500

a Predictors: (Constant), Technical

### Model 5

Data Series: 1000, 2000, 3000, 4000

Simple linear regression

Dependent Variable: Rank

Independent Variables: Business

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
5	.384(a)	.148	.115	.19129

a Predictors: (Constant), Business

### Model 6

Data Series: 1000, 2000, 3000, 4000

Simple linear regression

Dependent Variable: Rank

Independent Variables: I50, N50, T50, P50

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
6	.500(a)	.250	.050	.18870

a Predictors: (Constant), J50, E50, T50, N50

### Model 2 Predictions vs. Actual Ranks for TiEQuest

		Rank	Model2Rank
Rank	Pearson Correlation	1	.882(**)
	Sig. (2-tailed)		.000
	N	21	21
Model2Rank	Pearson Correlation	.882(**)	1
	Sig. (2-tailed)	.000	
	N	21	21

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

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## CURRICULUM VITAE

Abeer Al-Hassan Abbas received her Bachelor of Science in Computer Science and Masters of Science in Information Systems from American University in 1994 and 1997 respectively. She was employed as a computer science and information systems instructor at the Public Authority for Applied Education and Training (PAAET) in Kuwait from 1997 to 2001. As an instructor she also received certificates in Counseling Guidance (1997), Preparation of Teaching Methods (1997), Active Teaching Tools (1998), Class Stress Management (1998), and Scientific Research Methods (1999). She founded the Computer Science Club and received the Science Club Advisor Achievement Award at the College of Business Studies, Kuwait (1998). She is a member of Phi Beta Delta, and Women Entrepreneurs in Science and Technology (WEST). She was selected to receive a full fellowship to pursue her PhD degree. In 2002 Ms. Abbas joined George Mason University as a doctoral student in Information Technology. She won the top award in the technical entrepreneurship class in fall 2003. She received 3<sup>rd</sup> place honors from the College of Administrative Sciences in Kuwait in 2005 and First place honors in 2006 for her studies in Technical Entrepreneurship. Ms. Abbas has been selected for an assistant professorship position in the College of Business Administration at the Department of Quantitative Methods and Information Systems, Kuwait University. Her paper entitled The Technical Entrepreneurship Assessment Model (TEAM) has been accepted for presentation at the American Society for Engineering Education (ASEE) Conference in June 2008.