

**INFLUENCE OF ACADEMIC ENTREPRENEURIAL  
INTENTIONS ON THE CREATION OF UNIVERSITY  
SPIN-OFF FIRMS IN KENYA**

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**Influence of Academic Entrepreneurial Intentions on the Creation of  
University Spin-Off Firms in Kenya**

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Philosophy in Entrepreneurship in the Jomo Kenyatta University of  
Agriculture and Technology**

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**DECLARATION**

This thesis is my original work and has not been presented for a degree in any other University.

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## **DEDICATION**

To Anaya, Afandi and Amagove.

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## LIST OF ACRONYMS

<b>ST&amp;I</b>	:	Science, Technology and Innovation
<b>OECD</b>	:	Organization for Economic Co-operation and Development
<b>R&amp;D</b>	:	Research and Development
<b>UNECA</b>	:	United Nations Economic Commission for Africa
<b>ROK</b>	:	Republic of Kenya
<b>IPR</b>	:	Intellectual Property Rights
<b>TTOs</b>	:	Technology Transfer Offices



## DEFINITION OF TERMS

- Academic:** Refers to a student pursuing either undergraduate or postgraduate studies or faculty member teaching or conducting research at a recognized higher learning institution (Senelwa, Elegwa, & Kihoro, 2016).
- Academic Entrepreneurship:** This is the process of encouraging academics to think and act differently about opportunity recognition and identification of resources to pursue new ideas (Bwisa, 2011).
- Academic Entrepreneurial Intentions:** These are personal and/or environmental elements that influence academics' mindsets and direct his/her actions towards creating a spin-off firm (Ayuo & Kubasu, 2014).
- Co-operation With Industry:** Refers to coordination between different actors with basic researches (located in universities) and applied researches (located in industry and private applied research institutes or technology centres) that link science, technology and market (Montoro-

Sanchez, Mora-Valentin, & Guerras-Martin, 2006).

**Entrepreneurial Self-Efficacy:**

Refers to judgment of one's capability to successfully perform the tasks required for starting and managing a new business and their expectations toward the outcomes of creating a new venture. (Setiawan, 2014).

**Opportunity Identification and Recognition:**

Refers to the process of discovering and developing opportunities that will deliver value to stakeholders in prospective ventures (Ardichvili, Cardozo, & Ray, 2003).

**Technology Transfer:**

Refers to transferring a technology between a university and a commercial partner, including industry, academia, and national and county governments (Bwisa, 2011).

**Personal and Professional Networks:**

These are mechanisms for accessing the resources needed to undertake a spin-off firm. Where "personal networks" are relationships with those in our immediate environment,

such as relatives, friends and colleagues. “Professional networks” are relations derived from contacts formed during academic and research activities (Fernández-Pérez, Alonso-Galicia, Rodríguez-Ariza, & del Mar Fuentes-Fuentes, 2015).

**University Contextual Elements:**

Refers to the both internal and environmental factors that influence the inception, growth and development of a university in a quest to meet its mission, vision and objectives (Yıldırım & Aşkun, 2012).

**University Spin-off firm:**

Refers to a mechanism that enables a university student or academic staff transfer their knowledge and research findings to the market place (Grimaldi, Kenney, Siegel, & Wright, 2011; Rothaermel, Agung, & Jiang, 2007; Shane, 2004).

## ABSTRACT

The decision to become an entrepreneur and create a new business is a deliberate and conscious decision. Therefore entrepreneurial intentions can be seen as accurate predictors of planned behavior of creating spin-off firms by academics from the knowledge or research outputs originating from their respective universities. However, from universities' perspective transferring of technology and findings to the market place by academics has been on a downward trend for several past years. This study examined the influence of academic entrepreneurial intentions on the creation of university spin-off firms in Kenya. In particular, the study sought to determine the influence of entrepreneurial self-efficacy of creation of spin-off firms, the influence of personal and professional networks on creation of spin-off firms and influence of co-operation with industry on creation of spin-off firms. The study employed mixed approach research design: exploratory, descriptive, and causal research design. The study population was 15,064 students and academic staff drawn from the top 10 public and private universities in Kenya with a sample of 387 respondents randomly selected. A questionnaire was used to collect data. Data was analyzed using descriptive statistics and in addition multiple regression models were employed to test the hypotheses. The results indicated that although majority of academics in Kenya were at initial phase of conceptualizing and developing their business ideas for commercialization they had high entrepreneurial intentions to finally start and manage successful businesses. This is a common trend among most scholars in higher learning institutions that are found in developing countries across the world. Moreover, results showed that entrepreneurial self-efficacy, personal and professional network, co-operation with industry significantly influence creation of university spin-off firms. Opportunity identification and recognition and university contextual elements moderated academic entrepreneurial intentions and university creation of spin-off firms. However, personal and professional networks had the highest co-efficient of determination meaning that it had the best influence on creation of spin-off firms. Furthermore, university contextual elements had more significant moderating effect in the relationship between academic entrepreneurial intentions and university creation of spin-off firms. The study concluded that developing holistic entrepreneurial intentions among the university community is a gradual process that requires internally; active participation of university managers, academic staff and students' and externally; concrete university-industry-government linkages. The recommendations were that universities should develop personal and professional networks that will provide information, advice and emotional support for their entrepreneurial dynamism balancing academics' lack of managerial and commercial skills and hence contributing to bolstering academics' entrepreneurial intentions. Therefore at the base of entrepreneurial success, academics should work to improve their individual self-efficacy to guarantee positive outcomes and at the entrepreneurial apex, the universities should build meaningful collaborations with industry that will help identify and develop opportunities that will eventually grow into successful business ventures.

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Background of the study**

This study sought to investigate the influence of academic entrepreneurial intentions in creation of university spin-off firms in Kenya. Numerous studies attest that new venture creation is an outcome of intentions and entrepreneurship is a planned behavior (Bird, 1988; Katz & Gartner, 1988). Inasmuch as intention is a state of mind that focuses on the academic's attention, experiences and behaviors, academic's entrepreneurial intentions can be seen as an accurate predictor of planned behavior towards starting a spin-off firm (Fishbein & Ajzen, 1975). Hence, most entrepreneurial intention models emphasize the convergence of the academics individual attitudes and university's environmental factors to influence intentions that lead to creation of spin-off firms (Boyd & Vozikis, 1994).

Largely, universities across the world have been recognized as sources of knowledge creation and technological advances (Kalar & Antoncic, 2015). However, recently these institutions have once changed and positioned themselves as strategic assets in innovation and economic relevance by embracing a new role of 'entrepreneurial university' where its academics work towards commercializing their results (Etzkowitz, 1998). The effect has led to the creation of academic spin-offs which have since been seen as important means of transferring technology from academia to the market hence bringing economic renewal, competitiveness and growth (Granhagen & Volkmann, 2014; Mueller, 2006; Prodan & Drnovsek, 2010; Solow, 1994).

### **1.1.1 Academic entrepreneurial intentions in universities**

Entrepreneurship has been defined as the process of ‘emergence’ in the creation of organizations (Gartner, 1988; Gartner, Bird, & Starr, 1992). This means that entrepreneurship is viewed as a process undertaken by individuals to enable an organization to come into existence and is looked upon as a ‘process of becoming rather than a state of being (Bygrave, 1989). As a result, entrepreneurial intentions is perceived to be at the central of understanding entrepreneurship process which describes underpinnings of founding of new organizations (D’Orazio, Monaco, & Palumbo, 2012; Krueger & Carsrud, 1993). It is also important to understand academic entrepreneurial intentions because intentions correspond to a state of mind that directs their attention, experience, and action toward the goal of creating a spin-off firm (Bird, 1988). Entrepreneurial intentions also embody an academic’s commitment to start a new business (Krueger & Carsrud, 1993). In addition, intentions toward a behavior have routinely been proven to be the best single predictor of that behavior (Fishbein & Ajzen, 1975). Hence, entrepreneurial intentions are crucial to understanding the overall process of entrepreneurship as they serve as the key initial conduit for subsequent actions and events that are related to organizational formation (Bird, 1988; Boyd & Vozikis, 1994; Crant, 1996; Jenkins, 1997; Katz & Gartner, 1988; Krueger Jr, Reilly, & Carsrud, 2000; Krueger & Carsrud, 1993). Thus, the entrepreneurial intentions process may begin with the academic’s personal needs, values, wants, habits, and beliefs (Bird, 1988). Academics that have the intentions to start an organization have certain precursor attitudes, interests, values, and talents regarding entrepreneurship, and these form part of the content of their

entrepreneurial intentions (Bird, 1988; Gartner, 1988; Krueger Jr et al., 2000; Krueger & Carsrud, 1993).

Environmental factors, such as time constraints, task difficulty, and the influence of other people though social pressure; also influence entrepreneurial intentions (Ajzen, 1991; Boyd & Vozikis, 1994; Tubbs & Ekeberg, 1991). Entrepreneurial intentions among academics and students at the universities has emerged as an important element within entrepreneurship literature over the last few decades and continues to attract attention of many researchers due to its contribution to the development for many countries. Inside the universities the academic staff and students are potential academic entrepreneurs, they are critical in the identification of the best way for commercializing the results of their research to improve the technology transfer process. This kind of process is a consequence of two broad categories of determinants: individual with certain characteristics, abilities, and perceptions; a context which is conducive to venturing (Barbara & David, 1989).

### **1.1.2 Creation of university spin-off firms outside Africa**

#### **1.1.2.1 United States of America**

In a comparative perspective, the United States has been successful in creating and developing new technologies and turning them into competitive businesses. The transfer of research results from government funded R&D at federal and academic institutions to the private sector has grown significantly over the years. Today it represents an increasingly important part of the overall industrial commercialization of technologies. In general, institutions market their intellectual properties primarily through web-based

posting services (at the university or at the Association of University Technology Managers website). As a direct result of the Bayh-Dole Act, academic institutions across the U.S. have established a strong national technology-licensing infrastructure to support the commercialization of research results. Since the 1980s, the number of Technology Transfer Offices (TTOs) in universities has grown from 25 to well over 200. Their responsibility is to implement the Act by facilitating and managing the disclosure and licensing of inventions with commercial potential (Karlsson, 2004).

In 2002, the United States invested an estimated \$292 billion in R&D, which represented 2.8 percent of its Gross Domestic Product. The largest share of money came from industrial firms (66 percent) and the federal government invested about \$81 billion (28 percent) (Karlsson, 2004). In 2015, the universities and colleges in the US spent a combined \$68.8 billion on research and development. R&D spending was highly concentrated among the top research universities, with the top 20 schools accounting for more than 30% of all research expenditure among institutions of higher education in the U.S. Federal funding currently accounts for the largest portion of R&D funding for many of the largest research universities. In seven of the 10 universities spending more than \$1 billion on R&D, federal funding accounts for more than 50% of all R&D expenditure. Notably, there has been a reduction in federal R&D funding, due to expansion of nonfederal funding sources like businesses, nonprofits, and university coffers has increased at twice the rate of federal funding since 1972. R&D at the top research universities is heavily concentrated in the life sciences and engineering. Of the \$68.8



billion spent on R&D by all U.S. colleges and universities in 2015, 56.5% was dedicated to the life sciences -- primarily medicine -- and 16.1% to engineering (Karlsson, 2004) .

Stanford University, Massachusetts Institute of Technology (MIT), Columbia University and University of California (UC) are among those established institutions considered most successful at creation of spin-off firms. As a major public university, the UC is often considered a model that set standards for other universities. In 2004, UC held an active portfolio of almost 5,500 inventions, more than 3,000 U.S. patents and well over 200 companies had been founded to bring licensed technologies to the marketplace. To achieve this objective, the university has maintained an active patenting and patent licensing program for over 40 years. As a result, the UC with its ten campuses is the leading university system in the U.S. in terms of number of patents and in the number of successfully commercialized inventions. The UC has received more patents than any other university in the world, which includes successful inventions such as the human growth hormone. The Stanford's Office of Technology Licensing (OTL) was established in 1969, 11 years before most other universities took the same step because of the Bayh-Dole Act (for example, the Office of Science and Technology Development at Columbia University was established in 1982). In financial year 2002, Stanford earned about \$50 million in royalties from 385 technologies, 7 of those produced royalties of more than \$1 million dollars each. During that year, OTL concluded 112 new license agreements (down from 137 the year before) totaling \$1.4 million (down from \$3 million) in up-front license fees. The number of disclosures during the calendar year 2002 was a record 315 (up 9 percent from 2001). Approximately 48 percent were in the life sciences and the rest in the physical

and computer sciences with the rate of licensing of inventions being about 30 percent (Karlsson, 2004).

### **1.1.2.2 China**

China is now the second largest performer of research in the world and its universities are rapidly improving their research performance. While China began serious investment in university research only in the late 1980s, it has since then increased university research spending at a compound annual growth rate of 15 percent – a sustained rate of increase only rivaled by the U.S. in the post-Sputnik era. In 2014, China surpassed Japan in purchasing power parity terms, to become the second largest investor in university R&D (U.S. National Science Foundation 2016). Due to its size and visibility, China's investment in university research and deliberate emphasis on technology transfer is of particular importance, especially since the consensus has been that in developing countries UTT has been ineffective (Chapple, Lockett, Siegel, & Wright, 2005).

The impetus of Chinese National Technological Transfer Centres (CNTTC) formation is similar to that of Western UTTOs: to promote technology transfer from university to industry. However, the roles, performance, and effectiveness of NTTCs exhibit unique Chinese characteristics (Brundenius, Lundvall, & Sutz, 2009; Wu, Welch, & Huang; Yusuf & Nabeshima, 2007). The study focused on six universities which were the first batch to be allowed to set up a NTTC in China. They include; East China University of Science and Technology, Huazhong Science and Technology University, Shanghai Jiaotong University, Sichuan University, Tsinghua University, and Xi'an Jiaotong University The analysis of these six universities provides a general picture of NTTC as an

effective public policy tool in promoting the commercialization of university inventions in China. In addition, Zhejiang University which does not have a NTTC to compare research, patenting, and commercial activities was used. The rationale behind choosing Zhejiang University as a single case is that it ranks as one of the top five Chinese universities (comparable with Tsinghua University and Shanghai Jiaotong University) and is well-known for its technology management programs (Yusuf & Nabeshima, 2007).

As the role of NTTCs is to promote university commercial activities, published papers, patenting, licensing revenues, and revenues generated by university-run technology firms were used as indicators to assess the effectiveness of NTTCs. Since, the analytical focus compares NTTC outputs rather than that productivity, we prefer the usage of effectiveness instead of productivity/efficiency. In our assessment framework, published academic papers refer to the papers collected by the Science Citation Index (SCI). The existence of NTTCs promotes the information exchange between university researchers and firms. The interactions between industry and NTTCs may help researchers get new ideas to produce more qualified academic papers, and the growth of university patentability is supposed to bind with the performance of NTTCs. The number of both patent applications and issued patents obviously increased, especially after 2002. Between 2002 and 2003, except for East China University of Science and Technology and Xi'an Jiaotong University, the number of issued patents doubled in the other NTTC universities. Tsinghua University remained the leader with respect to patenting activities from 2001 to 2005, Zhejiang University occupied the second place, and Shanghai Jiaotong University was third. Whereas patent licensing has traditionally been the most efficient mode of university

technology transfer in Western countries (Chapple et al., 2005; Siegel, Waldman, Atwater, & Link, 2003), it accounts for only a very small part of all technology contracts in Chinese universities.

### **1.1.2.3 Japan**

Japanese reforms in national research systems aiming to increase technology transfer and the commercialization of the university research through academia-industry cooperation began to attract attention during the Japanese economic recession in the 1990s (Fujisue, 1998). The legislative changes took effect in 1999 when the Japanese government enacted Industrial Revitalization law and Related Laws, an equivalent to the Bayh Dole Act of the US. It aimed at encouraging research activities and promote the utilization of inventions arising from research or development support (Motohashi & Muramatsu, 2012).

In addition, Japanese Government has administered various policies, including a Program of Economic Structural Reform and the Science and Technology Basic Plan, in which academia-industry collaboration is given priority to revitalize the Japanese National Innovation System (NIS) (Fujisue, 1998). These strategies have been implemented with a network-based approach of University-Industry Collaboration (UIC) and the Japanese Science and Technology Basic plan has strongly advocated the promotion of active interactions among innovation leaders (Motohashi, 2005; Tantiyaswasdikul, 2012). The first major post World War II initiative to promote university industry interaction was promoted in 1983. This program was implemented to facilitate the joint research between universities and industries (Motohashi & Muramatsu, 2012; Tantiyaswasdikul, 2012).

In this program, professors were the central entity, and companies provided these professors with researchers and funding to pursue specific research projects (Hane, 1999; Sakakibara, 2007). The system of joint research marked the starting point of official joint research activities and, until the beginning of the 1990s, Japan introduced a UIC system modeled on the basis of the United States' achievement in university industry technology transfer in driving economic growth (Motohashi & Muramatsu, 2012; Tantiyaswasdikul, 2013). Due to its importance, the Science and Technology Basic Law was enacted in 1995 followed by many UIC policies in the first Science and Technology Basic plan (FY 1996-2000) that encourages the promotion of technology transfer from universities to industries, the Second Science and Technology Basic plan (FY 2001-2005) that reinforces university industry collaboration and Intellectual Property (IP) management, and the Third Science and Technology Basic plan (FY 2006-2010) that reorganizes the major tool for innovation. The Japanese government led the industry-university collaborations policy in the late 1990s through the TLO Act in 1998 and the Japanese Bayh-Dole Act in 1999, almost 20 years after the US Bayh-Dole Act was introduced in 1980. The Japanese Bayh-Dole Act has allowed universities to retain invention rights resulting from government-funded research. In 2004, another evolution was introduced when all Japanese national universities incorporated, which means that each university can drive not only research and education but also industry-university collaboration and IP management (Motohashi & Muramatsu, 2012; Shimoda, 2005). To develop commercialization activity, universities started building infrastructure, in the form of Technology Licensing Offices (TLOs) responsible for IP management and TT. The TLOs employ staff with commercial skills. Beginning with five in 1998, the number of approved TLOs had risen to 41 by 2005 (Walsh, Baba, Goto, & Yasaki, 2008) and by 2009 a total of 47 TLOs were approved by the Ministry of Education, Culture, Sport, Science and Technology (MEXT) and the Ministry of Economy, Trade

and Industry . In particular, the number of granted patents has increased substantially for Japanese universities, from 6570 to 25,945 over 2004-2013 (Motohashi and Muramatsu, 2012).

### **1.1.3 Creation of university spin-off firms in Africa.**

It is very important for universities to pay greater attention to the study of entrepreneurship in technology transfer; they need to be able to identify how wealth can be created from the spin-off companies (Wright et al., 2004). This section covers universities in South Africa and Ghana.

#### **1.1.3.1 South Africa**

Although nascent when compared internationally, technology transfer practices in South Africa have taken shape and gathered considerable momentum since 2004 when it was reported that, while a number of institutions had already developed and implemented IP policies, only three had one or more full-time employees dedicated to technology transfer and related matters (Garduño, 2004). As of 2009, formal technology transfer offices existed for 11 of the 13 institutions surveyed. Five TTOs had been in operation for at least eight years, and all appeared to have well defined technology transfer practices. However, another five TTOs had only been in operation for less than five years, indicating the rapid changes and appreciation for dedicated technology transfer practices. Of the two institutions that did not have formalized TTOs, the University of Pretoria was still in the process of establishing its official organisational structures, while Rhodes University was planning to participate in a regional collaborative effort in the Eastern Cape with the Nelson Mandela Metropolitan University (NMMU). Different policies have been designed to encourage the establishment of spin-offs from universities by academics, such as the Bayh-Dole Act in the United States and the Law on University Patenting in Denmark (Åstebro et al., 2013). Although South Africa has been behind in technology transfer, it is taking compelling steps in that direction.

South Africa has gone through political transformation in the past two decades and has not been able to escape its impact. The Green Paper on Higher Education Transformation produced by the Department of Education in 1996 (DOE, 1996) was its first policy document anticipating change. This was followed by the White Paper on Higher Education published in 1997 (DOE, 1997). It contends that research is the essential tool for generating new knowledge, while disseminating the knowledge through teaching and collaboration in research tasks is central to developing academic and research staff (Mpako-Ntusi, 2003). The DOE (1997) adds that the foregoing is concomitant with technological advancement and innovation, propelled by an excellent, well-organized and development system of research that takes into account the needs and the potentials of the relevant stakeholders. The South African government presented the Intellectual Property Rights (IPR) policy framework in 2003, aiming to transit South Africa from an economy that is dependent on resources to one that thrives on knowledge or a knowledge based economy (Kloppers, Tapson, Brandshaw & Gaunt, 2006). In South Africa, the commercialization of research output is still in its infancy phase and relatively few universities, and research centres have dedicated technology transfer offices (TTOs). While some efforts were made to promote technology transfer since the 1980s, it was not until 1990 that most universities and research organizations started to set up TTOs (Wilson, 2007).

### **1.1.3.2 Nigeria**

The management of IPR and the technology transfer are handled by the National Office for Technology Acquisition and Promotion which has established Intellectual Property and TTOs in tertiary institutions across the country to assist innovators prepare and file for IPR (Ogunwusi & Ibrahim, 2014). A legislative and administrative framework as well as incentives for researchers in Universities to disclose their ideas and inventions through both monetary and non-monetary mechanisms have been found to be effective towards promoting commercialization of research

results. A case study on University lecturers in Ilorin University in Nigeria indicate that less than 60% of the academic staff disseminate their research results and that commercialization takes a back seat with only about 28% of University lecturers developing research products that can be put into use for societal development, less than 10% of the University lecturers commercialized the outcomes of their research (Oduwaiye, Owolabi, & Onasanya, 2009). The study concludes that Research thrives in many Universities yet the rate of commercialization of research results is still low (OECD, 2013).

#### **1.1.4 Creation of university spin-off firms in Kenya.**

The National Commission for Science, Technology and Innovation (NACOSTI) formerly known as the National Council for Science and Technology is mandated to advice, coordinate, promote and regulate on matters of Science and Technology in Kenya (ST&I Act, 2013). NACOSTI administers the Research Endowment Fund created by the Ministry of Higher Education, Science and Technology now known as the Ministry of Education, Science and Technology on behalf of the Government of Kenya since 2008. The aim of the Fund is to support research and innovation projects by Kenyans in the country. Through the promotion of research, science and technology in higher education institutions, it is expected that the learning institutions translate their research findings into products and services, generate new ideas and adopt innovation to achieve an innovation-driven economy for Kenya's (NACOSTI, 2013).

NACOSTI coordinates the ST&I desks programme in Universities and Research Institutions in the country to enhance dissemination of research findings and partnerships



with institutions. NACOSTI also organizes fora for dissemination of Research products including an annual Science Week in the month of May. The Science, Technology and Innovation (ST&I) Act, 2013 advocates for the commercialization of research outputs through the Kenya National Innovation Agency which is established through the Act, but is yet to be operational. The University Act, 2012 also mandates Kenyan Universities to advance knowledge through teaching, scholarly research and scientific investigation and also dissemination of the outcomes of their research work to the public

Against this background, commercialization of university research outputs, amongst other things, requires the universities to possess appropriate policies and management systems to support research commercialization. Many of the initiatives by universities to commercialize their research in Kenya are rather new and no research has investigated them. For instance, in 2007, Masinde Muliro University of Science and Technology (MMST) established the Directorate of Science & Technology Park and Industrial Linkages (STPIL) under Planning, Research and Extension Division. Its mandate was to start, develop and manage the university Science and Technology Park (STP) and market investment opportunities emanating from the research carried out within and outside the university. Its role also includes linking the industry to the Science Park through collaboration with both private and public sectors keen to incubate and establish their business in the S&TP. The University of Nairobi boasts of the AfriLab centre which was set up in 2011 and brings together student innovators with the objective of designing new products. In January, 2013, The Ministry of Information and Communications under the World Bank and funded by the Kenya Transparency and Infrastructure Project launched a \$1.6 million public-private sector

partnership with Nailab to create a Tech Business Incubation program that supports Kenyan ICT startups (ROK, 2007).

In April 2013, Strathmore University with support from idea Foundation, launched ilabAfrica innovation centre. The state-of-the-art facility accommodate up to 50 entrepreneurs who are not only given seed capital to kick-start their projects but are also given offices for Business Process Outsourcing (BPOs), business mentorship and consultation services. May 2013, Kenyatta University, with the support from the Chandaria Foundation inaugurated Chandaria Business Innovation and Incubation Centre that costed over Sh50 million. The centre admits 18 to 25 students for entrepreneurship training for between six months and a year. Others that have in the past shown interest in incubation concept are Egerton University and Jomo Kenyatta University of Agriculture and Technology (JKUAT) among other. Undoubtedly, individual academic entrepreneurs are at the heart of academic entrepreneurship. They are a key resource in strategy delivery, entrepreneurship education, support for business start -ups and all entrepreneurial activities the university wants to develop. In January 2012, Egerton University started an Agro-Park Project to act as a major player in provision of some practical solutions to the problems encountered in the implementation of projects under the Kenya Vision 2030. The aim is to improve the livelihoods of people, 75% of whom are dependent on agriculture and livestock production. Jomo Kenyatta University of Agriculture and Technology, “pioneered in commercializing tissue culture bananas, hence bringing together teaching, research and product commercialisation.” In February, 2012, Ministry of Industrialization and JKUAT launched a 2.2 billion Industrial and Technology Park

designed to contribute to Kenya's growth to a newly industrialized economy within the broad framework of Vision 2030 by providing avenue for university researchers to incubate and commercialize their innovations (ROK, 2007).

#### **1.1.5 Summary of academic entrepreneurial intentions and creation of spin-off firms**

Therefore, it is evident from this background that over the last decades, an increasing interest has developed in the field of technology transfer from academic institutions, and as part of this a growing awareness of the importance of university spin-offs that academic entrepreneurship has evolved. Universities are regarded as promising patrons of innovation, business creation and technological change through university – industry collaborations and through their backing of new knowledge-intensive start-ups (Etzkowitz, 2003; Etzkowitz & Leydesdorff, 2000). As a result of the growing need for universities to contribute to economic development, pro-active universities have considered technology creation, transfer and commercialization to be a component of their explicit mission.

While on the other hand, researchers can be motivated in three key ways; recognition among their peers including promotion, monetary reward, availing resources or funding or through encouragement to increase their productivity through publications and patents (Adoyo, 2015). Researcher's motivation towards generating research outputs is key for them to develop exploitative behavior. To boost their motivation; training by university on importance of transferring knowledge is a crucial element as well as setting up a reward program for researchers involved in commercialization. Reputation and recognition has been found to

supersede any financial or economic profits researchers may accrue from the commercialization process (Adoyo, 2015).

## **1.2 Statement of problem**

The entrepreneurial decision to create and manage one's own business is a complex process that is subject to the influence of both individual and contextual determinant factors. Prior researches have shown that academic entrepreneurial intention can be influenced and guided by both personal and environmental factors (Fayolle, Gailly, & Lassas-Clerc, 2006; Souitaris, Zerbinati, & Al-Laham, 2007). Empirical researches have highlighted self-efficacy as the strongest personal factor that influences academics' entrepreneurial intention (Carr & Sequeira, 2007; Zhao, Seibert, & Hills, 2005). On the other hand social networks and co-operation with industry are critical environmental factors that encourage entrepreneurial collaborations with knowledge users and facilitate technology transfer (Perkmann et al., 2013).

From universities perspective, transferring of knowledge and research findings to the market place by academics has been on a drastic downward trend and other institutions it has never taken off (UNECA, 2013). For instance, annual growth rate in patent applications by universities fell from 11.8% to 1.3% between 2006 and 2010. Universities and public research institutions (PRIs) even experienced negative growth of -1.3% over the same period, compared to +5.3% growth between 2001 and 2005 (OECD, 2013). In Kenya, between 2004-2015 at least five public universities instituted Intellectual Property (IP) policies, to date only three universities have started technology transfer offices or academic spin-off firms despite continued government policy support (Ogada, 2015).

Despite Kenya launching the National Science, Technology and Innovation (ST&I) Policy and Strategy (ROK, 2008), enacting a substantive legislation ("Science, Technology and Innovation Act," 2013) and numerous University-Industry-Government collaborations to influence academic entrepreneurial mindset, minimal tangible results have been exhibited in stimulating and entrenching innovation and value-addition activities in the marketplace that lead to successful spin-offs formation. In 2013, four institutions in Kenya commercialized their R&D outputs, only two indicated that they had generated income from commercial activities, and one institution applied for 11 trademarks (UNECA, 2013). In addition, Kenya's number of researchers per million inhabitants was 100 compared to 815 in South Africa, which is far below innovative economies such as the Republic of Korea (4,627 researchers per million inhabitants). Even though research interests on academics' spin-off firms has been expanding albeit slowly in local universities (Adoyo, 2015; Awuor, 2013; Bwisa & Gachuhi, 1999; Kilonzo & Nyambegera, 2014), knowledge gaps exist as to the processes and elements that singularize the development of academics' entrepreneurial intentions that lead them to creating spin off firms. Therefore, this study aimed at investigating the influence of academic entrepreneurial intentions on the creation of university spin-off firms in Kenya.

### **1.3 Objectives of the study**

#### **1.3.1 General objective**

The purpose of the study was to examine the influence of academic entrepreneurial intentions on the creation of university spin-off firms in Kenya.

### **1.3.2 Specific objectives**

The specific objectives were:

- 1) To establish the influence of entrepreneurial self-efficacy on the creation of university spin-off firms in Kenya.
- 2) To determine the influence of personal and professional networks on the creation of university spin-off firms in Kenya.
- 3) To investigate the influence of cooperation with the industry on the creation of university spin-off firms in Kenya.
- 4) To find out the influence of joint academic entrepreneurial intentions on the creation of university spin-off firms in Kenya.
- 5) To establish the influence of moderating effect of opportunity identification and recognition on the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya.
- 6) To examine the influence of moderating effect of university contextual elements on the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya.

### **1.4 Research Hypotheses**

A hypothesis is a tentative statement about the relationship between two or more variable. Thus the research hypotheses' was as follows:

**Hypothesis H<sub>01</sub>:** Entrepreneurial self-efficacy has no significant influence on the creation of university spin-off firms in Kenya.

**Hypothesis H<sub>02</sub>:** Personal and Professional Networks have no significant influence on the creation of university spin-off firms in Kenya.

**Hypothesis H<sub>03</sub>:** Cooperation with the industry has no significant influence on the creation of university spin-off firms in Kenya.

**Hypothesis H<sub>04</sub>:** Joint academic entrepreneurial intentions have no significant influence on the creation of university spin-off firms in Kenya.

*(Hypotheses H<sub>05</sub> and H<sub>06</sub> tested sub-hypothesis based on each of independent variable)*

**Hypothesis H<sub>05</sub>:** Opportunity identification and recognition have no significant moderating effect on the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya.

***Hypothesis H<sub>05a</sub>:** Opportunity identification and recognition have no significant moderating effect on the relationship between entrepreneurial self-efficacy and the creation of university spin-off firms in Kenya.*

***Hypothesis H<sub>05b</sub>:** Opportunity identification and recognition have no significant moderating effect on the relationship between personal and professional networks and the creation of university spin-off firms in Kenya.*

***Hypothesis H<sub>05c</sub>:** Opportunity identification and recognition have no significant moderating effect on the relationship between co-operation with industry and the creation of university spin-off firms in Kenya.*

**Hypothesis H<sub>05d</sub>:** *Opportunity identification and recognition have no significant moderating effect on the relationship between joint academic entrepreneurial intentions and the creation of university spin-off firms in Kenya.*

**Hypothesis H<sub>06</sub>:** University contextual elements have no significant moderating effect on the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya.

**Hypothesis H<sub>06a</sub>:** *University contextual elements have no significant moderating effect on the relationship between entrepreneurial self-efficacy and the creation of university spin-off firms in Kenya.*

**Hypothesis H<sub>06b</sub>:** *University contextual elements have no significant moderating effect on the relationship between personal and professional networks and the creation of university spin-off firms in Kenya.*

**Hypothesis H<sub>06c</sub>:** *University contextual elements have no significant moderating effect on the relationship between co-operation with industry and the creation of university spin-off firms in Kenya.*

**Hypothesis H<sub>06d</sub>:** *University contextual elements have no significant moderating effect on the relationship between joint academic entrepreneurial intentions the creation of university spin-off firms in Kenya.*



### **1.5 Significance of the study**

The study is important because it provides a comprehensive review of academic researches dealing with determinants of academic entrepreneurial intentions with the aim of igniting and increasing entrepreneurial activity among academics stretching from undergraduate students all through to the postgraduate graduates/researchers in Kenya. It provides relevant information to the higher-learning institutions that will enable them design and develop programmes elevate them to entrepreneurial universities. It offers a comprehensible summary of evidence regarding interventions that government, government-related agencies and other stakeholders can use in assessing and considering whether to introduce and/or redesign institutional policies and bolster their capabilities in order to increase scientific research, innovation and commercialization activity among academics scholars. The analysis highlights not only what is known but what is unknown concerning university-industry- government interventions and therefore the information can be used by all those who seek to shape the emerging Kenya's academic entrepreneurship landscape.

### **1.6 Scope of the study**

This research was carried out in November-December 2015 on 387 academics (students and staff) in Pure and Applied Sciences, Medicine, Engineering and Computer Science, Technology faculties or departments in the top 10 public and private universities in Kenya.

### **1.7 Limitation of the study**

The major limitation was establishing the standard process in creation of university spin-off firms from the academics at the universities. To minimize the limitation, the researcher relied on the sufficient subjective and objective data that was gathered from the

respondents and thereafter appropriately analyzed using the appropriate regression models. In addition, challenges arose when comparing the methodological processes in previous studies on academic entrepreneurial intentions and the current study. Comparably, there was deficient empirical evidences from postgraduate students/researchers/academic staff as compared to undergraduate students. However with the application of appropriate regression analysis and model the limitation was immensely minimized again. Thus, any remaining limitation(s) that was not adequately tackled in the study was treated as a recommendations for future researches.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This chapter presents a review of literature on the research study. It is organized under relevant sub-headings that include: Introduction, where the chapter's layout is presented; Theoretical framework, where theories that relevant to the research study are discussed; Conceptual framework of the relevant variables derived from the theories, the research objectives and hypotheses; and Empirical framework containing the current literature based on each relevant variables postulated from the theories.

#### **2.2 Theoretical framework**

Various theoretical approaches underpinning the current study are presented in this section. According to Cooper and Schindler (2003), a theoretical framework is a set of theories comprising inter-related concepts, definitions, and propositions that are advanced to explain and predict phenomena. Theories are formulated to explain, predict, and understand phenomena and, in many cases, to challenge and extend existing knowledge within the limits of critical bounding assumptions (Cooper & Schindler, 2003).

Several theories have been put forward by scholars to explain the field of entrepreneurship. These theories have their roots in economics, psychology, sociology, anthropology, and management. In this section, the classical theories of entrepreneurship namely economic, psychological and sociological has been discussed with the view to describe the relationship they have between academic entrepreneurial intentions and creation of spin-off firms in Kenya. Thereafter, specific theories on each of the variable are explained with view to show their relevance to the current study.

## **Economic Theory of Entrepreneurship**

Economic entrepreneurship theory has deep roots in the classical and neoclassical theories of economics, and the Austrian market process (AMP). These theories explore the economic factors that enhance entrepreneurial behaviour. The classical theory explained the virtues of free trade, specialization, and competition while on the other hand the neo-classical model emerged from the criticisms of the classical model and indicated that economic phenomena could be turned into instances of pure exchange in an economic system that was basically closed. These unanswered questions of the neo-classical movement led to a new movement which became known as the Austrian Market process (AMP). The AMP, a model influenced by Joseph Alois Schumpeter (1934) concentrated on human action in the context of an economy of knowledge Schumpeter (1934).

Schumpeter (1934) suggested creative destruction whereby established ways of doing things are destroyed by creation of new, quicker, better and cost-effective ways. In this study creation of university spin-off firms are a functions of multiple economic factors that determine the various growth phases: conception and development, commercialization, growth and stability (Kazanjian, 1988).

## **McClelland's Human motivation Theory**

Psychological entrepreneurship theorists deal with personal characteristics that define entrepreneurship. David McClelland in this book, "*The Achieving Society*", identified three dominant motivators that he believed we all have: a need for achievement (*nAch*), a need for affiliation (*nAff*), and need for power (*nPow*). A person with strong *nAch* sets and takes calculated risks to accomplish challenging goals, while one with strong *nAff* as

the predominant behaviour wants to belong to a group, and favours collaboration over competition. A person with strong *nPow* want to control and influence others, enjoys competition and winning (McClelland, 1961).

Entrepreneurs with high *nAch* need to succeed with one's own efforts, *nPow* lead entrepreneurs to dominate and influence others, while *nAff* lead entrepreneurs to maintain friendly relations with others, and more likely to become entrepreneurs (McClelland, 1961). In this study, academic entrepreneurial intentions are a form of achievement where academic entrepreneurs are high *nAch* individuals who prefer to set goals that has moderate probability success.

### **Sociological Theory of Entrepreneurship**

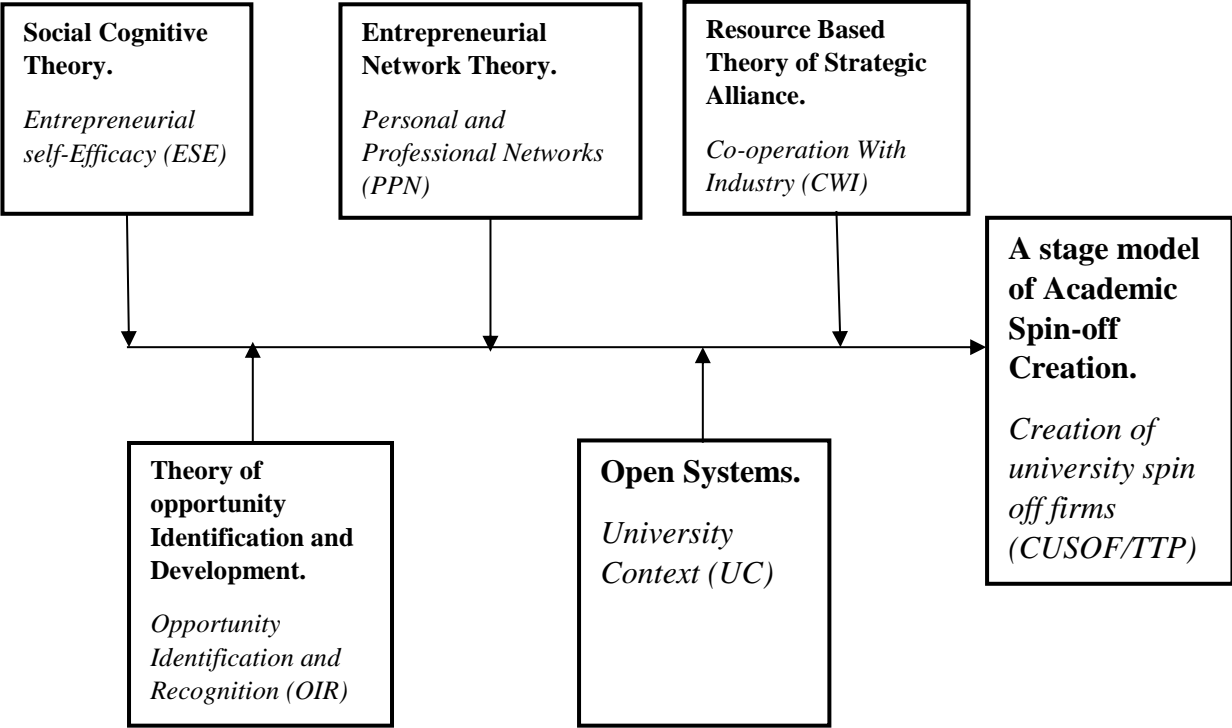
The sociological theory is the third of the major entrepreneurship theories. Sociological enterprise focuses on the social context. In other words, in the sociological theories the level of analysis is traditionally the society. Simpeh (2011) has identified four social contexts that relates to entrepreneurial opportunity. The first one is social networks. Here, the focus is on building social relationships and bonds that promote trust and not opportunism. In other words, the entrepreneur should not take undue advantage of people to be successful; rather success comes as a result of keeping faith with the people. Secondly, it is the life course stage context which involves analyzing the life situations and characteristic of individuals who have decided to become entrepreneurs. The experiences of people could influence their thought and action so they want to do something meaningful with their lives. Thirdly, it is ethnic identification. One's sociological background is one of the decisive "push" factors to become an entrepreneur. Lastly, the fourth social context is called population ecology. The idea is that

environmental factors play an important role in the survival of businesses. The political system, government legislation, customers, employees and competition are some of the environmental factors that may have an impact on survival of new venture or the success of the entrepreneur (Simpeh, 2011). In this study all the components, social networks, personal experiences, social background and environmental factors are seen to be the predominant factors that influence academic to create spin-off firms.

**2.2.1 A stage model of academic spin-off creation**

**Creation of University Spin-Off Firms (CUSOF)**

Academic entrepreneurship is not a single event, but rather a continuous process comprised of several of events (Friedman & Silberman, 2003).



**Figure 2. 1 Conceptualized Theoretical Framework from the theories**

Therefore the formation of university spin-offs was viewed under the stage model of academic spin-off creation. Ndonzuau, Pirnay and Surlmont (2002) identifies four stages as relevant in explaining the transformation of academic research results into economic value. Each of these four stages has a specified function in the global spin-off process. The first stage generates and assesses ideas with regard to possible commercialization; the second stage considers these ideas and translates the most promising of them into genuine entrepreneurial projects; the third stage realizes the best projects by creating new spin-off firms; and the fourth stage consolidates and strengthens the economic value created by these new firms (Ndonzuau, Pirnay, & Surlmont, 2002).

Ndonzuau et al. (2002) observed that the four stages are wholly dependent of each other. Economic value depends on the quality of firms, which depends on the quality of finalized projects, which themselves depend on the quality of the initial ideas. However, the third stage deals with the creation of a new firm to exploit an opportunity managed by a professional team and supported by available resources. These are the three key pillars of any entrepreneurial success (Timmons & Spinelli, 1999). The issues that have to be dealt with will progressively move away from specific academic contingencies towards business considerations.

This study also theorized from Kazanjian (1988) whose research generated a midrange theory of growth that could be applied to creation of spin-off firms. The four stage model includes conception and development, commercialization, growth and stability. The

validity of this stage-of-growth model could be assessed by studying the relation of dominant phase in spin –off firms. The dominant type of problems that spin-off firms might encounter include resource acquisition, technology development, vendor relations, production start-up, growth of sales and market share, profitability and internal controls. Therefore, this study combined both Ndonzuau et al. (2002) and Kazanjian (1988) approaches to theorize, an integrated stage model of academic spin-off creation to explain a comprehensive process of technology transfer from academic research institutions such as universities, laboratories. Thus; 1) Generate phase-generating a viable business idea (*conception and development*); (2) Finalize phase- translating the idea into a business process (*Commercialize*); (3) Launch phase-creating a firm (*Growth*) and (4) Strengthen phase-contributing value to customers, employees, investors, and all other stakeholders (*Stability*).

### **2.2.2 Social Cognitive Theory**

#### **Entrepreneurial Self –Efficacy (ESE)**

Entrepreneurial Self-efficacy (ESE) is grounded in social cognitive theory (Bandura, 1977). The theory explains academic behavior as “a product of the interplay of intrapersonal influences, the behavior the scholar engage in, and the environmental forces that impinge upon them”(Bandura, 1977). The interactions among these factors shape academics beliefs in having the ability to successfully inhibiting desirable entrepreneurial intentions towards the formation of a new venture from technology transfer (Bandura, 1982). Similar sentiments are suggested by Boyd and Vozikis (1994) who notes that the concept of self-efficacy, derived from social learning theory plays an important role in the development of entrepreneurial intentions and actions. Therefore, the self-efficacy



perspective is highly appropriate for this study because ESE is about academics' beliefs regarding their own capabilities for attaining success and controlling cognitions for successfully handling contesting goals during the entrepreneurial tasks. In other words, entrepreneurial self-efficacy refers to the strength of an academic's belief that he or she is capable of successfully performing the roles and tasks of an entrepreneur (Boyd & Vozikis, 1994; Scherer, Adams, & Wiebe, 1989). Thus, this leads the researcher to propose the following:

**Hypothesis H<sub>1</sub>:** Entrepreneurial self-efficacy influences the formation of university spin-off firms in Kenya.

### **2.2.3 Entrepreneurial Network Theory**

#### **Personal and Professional Networks (PPN)**

Personal and Professional Networks was looked through the Entrepreneurial Network Theory. Ostensibly, academic entrepreneurs interact with a number of different people through the different steps of the academic entrepreneurial process such as local environment, family, friends, organizations and social- or political environment (Spilling, 2006, Borgatti & Foster, 2003). All the different parties create the basis for a formidable academic entrepreneurs' network, and the factors that create both opportunities and barriers to the entire academic entrepreneurial process. Every person you know is a part of your network, and could be labelled in relation to what he/she represents (Prell, 2012).

The theory of entrepreneurship network theory builds on the traditional social network theory that was originally developed in sociology studies (Hoang & Antoncic, 2003). The research connecting social network theory with entrepreneurship is quite new in a research

context. Some of the first contributors to the field are Birley (1986), Aldrich & Zimmer (1986) and Johannison (1988). Earlier research often focused on the individual entrepreneur, and the environment that affected them was often neglected. Now, the entrepreneurship network theory is more complex. The individual entrepreneur often has a set of characteristics placed in a network context, and they function simultaneously in entrepreneurship network theory.

In this study, a network is defined as a set of actors connected by a set of ties (Borgatti & Foster, 2003), and the role of the network is not only related to the creation of spin-off firm but is valid throughout the entire life cycle of the new venture (Hoang & Antoncic, 2003). In order, to use the network as an analytical tool, the academic entrepreneurial networks are divided into two main categories: informal (personal) and formal (professional). Informal networks (personal); are the most important network during the academic entrepreneurial process (Foss, 2006). It consist of the academic entrepreneurs' web of relationships, including friends, family, acquaintances etc. They provide important sources of information and knowledge, or contacts that may be helpful in other aspect of a business's development. This links are distinct from formal networks in that they are not officially directed by organizations, and in that the content of their exchanges can be personal, social or work-related (Ibarra, 1993).

Formal networks (professional) are alliances of spin-off firms within them, and are often separated into two different sub-categories (Foss, 2006); service and industrial. The service sector of network is public and private institutions, which assist the academic

entrepreneur, financially or by providing other resources while on the other hand the industrial sector of networks is the different actors in parts of the value chain, such as suppliers, distributors and exporters. Therefore, personal and professional enhances the academics' ability to create university spin-off firms in form of three components: provide academic entrepreneurs with information (e.g., market information, new opportunities) as well as tangible resources (e.g., human resources, financial resources) as well as intangible resources (e.g., social support, problem solving) held by other actors (Hoang & Antoncic, 2003; Nicolaou & Birley, 2003; Shane & Stuart, 2002; Walter, Auer, & Ritter, 2006). Thus, this leads the researcher to propose the following:

**Hypothesis H<sub>2</sub>:** Personal and Professional Networks influence the creation of university spin-off firms in Kenya.

#### **2.2.4 Resource-Based Theory of Strategic Alliances**

##### **Co-operation With Industry (CWI)**

The resource-based view theory of strategic alliances has recently emerged as an alternative approach to understanding cooperation between universities and industry with respective to their competitive strategies. According to this view, a university spin-off firm is equivalent to a broad set of resources that it owns. Wernerfelt (1984) defines resources as “those (tangible and intangible) assets which are tied semi-permanently to the spin-off firm. The resource-based rationale emphasizes value maximization of a spin-off firm that is achieved through pooling and utilizing valuable resources. Particularly spin-off firms are viewed as attempting to find the optimal resource boundary through which the value of their resources is better realized than through other resource combinations. Pensrose (1959) and Wernerfelt (1984) opined that the resource-based view assumes that spin off firms have bundles of resources which describe either their strengths, advantages, or assets

that can further be categorized as either tangible or intangible. Examples of such resources include technical know-how, management skills, capital, and reputation.

In this study, the resource-based view can be broadened to alliances that allow resources endowed by spin-off firms to generate needs and create opportunities for important cooperation with other persons or partners (Wernerfelt, 1984). For instance, in a university set-up, spin-offs are likely to form business collaborations with other new ventures from their own vulnerable positions for which they need additional resources. Similarly, academics will engage with other scholars from wide scope and industry partners on the basis on their resource-deficiency. The alliances can provide the various spin-off firms and individual academics the unique competitive edge that guarantees them strong socio-economic positions that enables them to know, attract and engage partners.

In contrast to traditional industrial organization economics which relied heavily on the analysis of the competitive environment, Wernerfelt (1984) observed that resource-based view focuses on the analysis of various resources possessed by particular spin-off firm, hence, paying more attention to its resources than to its external environment. Thus, a resource-based view seems particularly appropriate in this current study, it espouses critical associations between the university spin-off firms and the industry in a bid to gain access to larger partners' valuable resources. Autio et al. (1996) concluded by noting that spin-off firms within the universities and industry work together due to financial, technological, strategic, educational and political motivations. Therefore, the researcher propose the following hypotheses:

**Hypothesis H<sub>3</sub>:** Cooperation with the industry promotes the creation of university spin-off firms in Kenya.

## **2.2.5 Theory of Opportunity Identification and Development**

### **Opportunity Identification and Recognition**

Most authors and numerous empirical findings deduce that the initial stage in the creation of university spin-off firms is the identification and refining of a viable economic opportunity from an innovation that exists in the market (Kuratko, 2001; Baron 2004; Timmons, 1999; Bhave, 1994). Without the recognition of an opportunity the entrepreneurial process is likely to result in failure (Kodithuwakhu & Rosa, 2002; McCline et al, 2000). In the study, opportunity identification and recognition was examined through “Theory of Opportunity Identification and development” by Ardichvili, Cardozo, & Ray (2003). Opportunity recognition corresponds to the principal activities that take place before a business is formed or structured (Fletcher, 2006; Hill & Stewart, 2000). This includes recognition of an opportunity, evaluation, and development into a venture.

The development process begins when academic entrepreneurial alertness exceeds a given brink level. Alertness is likely to be intensified when there is a coincidence of several factors: certain academic personality traits (self-efficacy and creativity); relevant prior knowledge and experience in technology transfer; and personal and professional networks. The particular activities within the process are also affected by the degree of specificity of knowledge about market needs and resources (Ardichvili et al., 2003). Shane (2000) found that prior knowledge of markets; ways to serve markets and customers’ problems

influence the discovery of opportunities. The academic entrepreneur's ability to connect specific knowledge and a commercial opportunity requires a set of skills, aptitudes, insights, and circumstances that are neither uniformly nor widely distributed (Ardichvili et al., 2003). Scholars with strong entrepreneurial intentions may be more likely to quickly develop new opportunities about how a new piece of information such as that relating to a technological innovations will impact a specific project idea long before it can be methodically and rationally explained. Therefore, opportunity identification and recognition stage can be divided into five main steps namely getting the idea/scanning the environment, identifying the opportunity, developing the opportunity, evaluating the opportunity and evaluating the team (Gartner et al, 1999; Ardichvili et al, 2003). Thus, this leads the researcher to propose the following:

**Hypothesis H4:** Opportunity identification and recognition moderates relationship between academic entrepreneurial intentions and the formation of university spin-off firms in Kenya.

### **2.2.6 Open-System Theory**

#### **University Contextual Elements**

Traditional theories regarded organizations as closed systems that were autonomous and isolated from the outside world. In the 1960s, however, more holistic and humanistic ideologies emerged. Recognizing that traditional theory had failed to take into account many environmental influences that impacted the efficiency of organizations, most theorists and researchers embraced an open-systems view of organizations. Open systems theory was developed after World War II in reaction to earlier theories of organizations, such as the human relations perspective of Elton Mayo and the administrative theories of

Henri Fayol, which treated the organization largely as a self-contained entity. Thus, in this study the university contextual elements was considered through open-system theory.

Environmental influences that affect a university can be described as either specific or general. The specific environment refers to the network of suppliers, distributors, government agencies, and other universities research institutions with which university operates. The general environment encompasses four influences that originates from the geographic area in which the university functions. These are: *Cultural environment*; which shape views about ethics and determine the relative importance of various issues. *Economic environment*; which include economic growth, recessions, regional unemployment, and many other regional factors that affect a university's ability to grow and prosper. *Legal/political environment*; which effectively helps to allocate power within a society and to enforce laws. The legal and political systems in which a university operates play a key role in determining the long-term stability. These systems are responsible for creating a conducive environment for the university community, but they are also adequate legislation and regulation. *Quality of education*; which is an important factor in effecting universities attracts and retains highly qualified and experiences scholars that will adequately participate in research and innovation. Therefore, open systems theory refers simply to the concept that universities are strongly influenced by their environment that exert various forces of an economic, political, or social nature. The environment also provides key resources that sustain the organization and lead to change and survival. Thus, this leads the researcher to propose the following:

**Hypothesis H5:** University contextual elements moderates the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya.

### **2.3 Conceptual Framework**

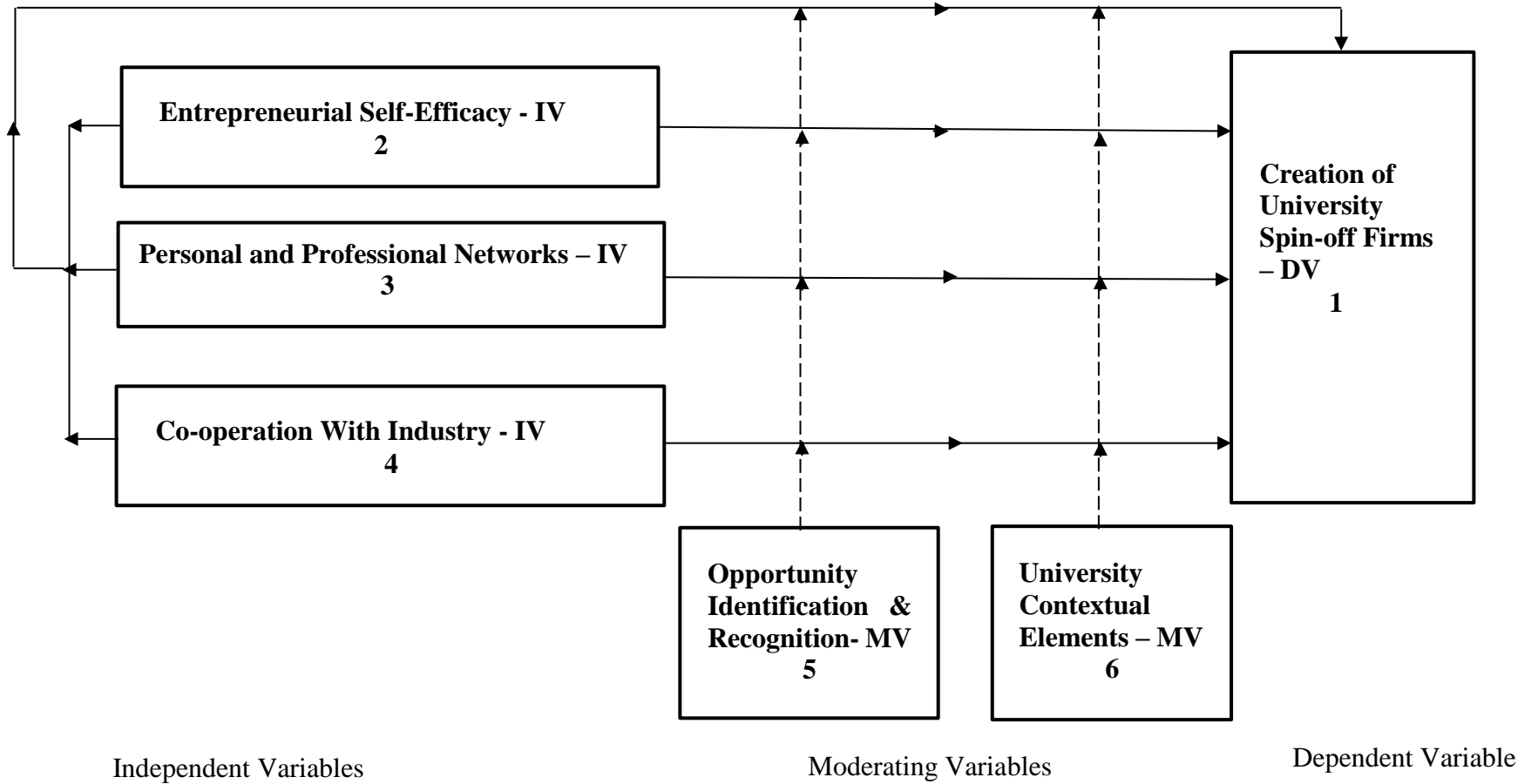
After comprehensive literature review comprising relevant theories and a series of empirical studies on academic entrepreneurial intentions and creation of university spin-offs, a conceptual framework was formulated. It conceptualized that: Dependent variable (DV) was Creation of University Spin-Off Firms (CUSOF/TTP) that was being influenced by the independent variables (IV); Entrepreneurial Self-Efficacy (ESE), Personal and Professional Networks (PPN) and Co-operation With Industry (CWI and moderated by variables (MV); Opportunity Identification and Recognition(OIR) and University Contextual Elements (UCE). The model was operationalized as illustrated by the conceptual framework (See Figure 2.2).

#### **2.3.1 Creation of University Spin-off firms**

Creation of a university spinoff is one of the commonest way that the university uses in a bid to transfer knowledge and research findings to the market (Grimaldi, Kenney, Siegel, & Wright, 2011; Rothaermel et al., 2007; Shane, 2004). Birley (2002) defines a university spin-off as a company that is created using the intellectual assets of the university, but which is neither wholly owned nor managed by the university. She further categorizes the spin-off into three groups, first group; The Orthodox Spinout where the company is formed by one or more academics. They leave the university to form the company, and



the break is clean. The second group; the technology spin-off where an outside investor/manager buys or leases the IP from the university and forms a new company.



**Figure 2. 2 Conceptual framework**

The inventor academics continue with their research and have nothing to do with the day to day management, although they may hold equity and/or act as consultants. The last group; Hybrid Spinout which is a combination of the other two (Sætre, Wiggins, Atkinson, & Atkinson, 2009).

In this regard, creation and development of a university spinoff can be done in a formal or informal way depending on how this is arranged with the university (Djokovic & Souitaris, 2008; Mansour & Maliqi, 2016; Shane, 2004). In practical terms, this study will focus on formal university spinoffs where on one hand the internal party that is inventor, student, researcher, and academic staff and on the other hand the external party that is entrepreneur and investor, to commercialize the technology by forming a company (Mansour & Maliqi, 2016; Shane, 2004). Many researchers consider a university spinoff created by current and former, students, members or employees of an academic institution (Djokovic & Souitaris, 2008; Mansour & Maliqi, 2016; Shane, 2004).

In case, the research takes that approach, in examining companies, the study will need to consider a broad range of firms, including those that were created under factors distant from university (Mansour & Maliqi, 2016; Shane, 2004). For the purpose of the research, consideration will be made only to firms that are developed or are in the process of being developed by individuals affiliated with the university and in the academic setting (Mansour & Maliqi, 2016; Shane, 2004). This understanding directs the study into looking only at the development of new companies which exploit university allocated patented inventions, copyrights, know-how, and even trade secrets (Mansour & Maliqi, 2016;

Shane, 2004). Companies which manifest different business activities such as “consultancy, intellectual property licensing, software, product, and infrastructure creation” (Rothaermel et al., 2007), and founded and lead either by entrepreneurs who may come from outside academia or inventors themselves (Mansour & Maliqi, 2016; Shane, 2004).

Remarkably, creation of development of the technology used by a university spinoff is a multi-stage process described by numerous models. However this research adopted ‘A stage model of academic spin-off creation’ by Nlemvo, Fabrice, & Bernard (2002) integrated with Kazanjian (1988) where they identified four important stages in the development of university spinoffs: (1) Generate phase-generating a viable business idea (*conception and development*); (2) Finalize phase- translating the idea into a business process (*Commercialize*); (3) Launch phase-creating a firm (*Growth*) and (4) Strengthen phase-contributing value to customers, employees, investors, and all other stakeholders(*Stability*). The four stages of the model are interdependent to each other (Kazanjian, 1988; Nlemvo et al., 2002; Pattnaik & Pandey, 2014).

### **2.3.2 Entrepreneurial Self-Efficacy**

Entrepreneurial Self-efficacy (ESE) refers to judgment of academics’ capability to accomplish a certain level of performance or desired outcomes (Bandura, 1986). According to Bandura (1986), academics gradually accumulate their ESE through prior cognitive, social, and physical experiences (Gist, 1987). As such, prior successful enactment of a task can change scholar’s expectations and help further reinforce his or her ESE. ESE has a number of practical and

theoretical implications for entrepreneurial success because initiating a spin-off firm requires unique skills and mind sets, which may be far different from those required for conventional managers in a fully established organization (Chen et al., 1998). Sometimes, roles for an academic entrepreneur may not be clearly defined, and many uncertainties may exist regarding the success spin-off firm. By definition, an academic with a high level of ESE, who truly believes in his or her capability to execute all of the requirements to successfully create a spin-off firm is more likely to see the positive potential outcomes that might accrue the new outfit. As a result, the entrepreneur may sustain more effort through the entrepreneurial process to achieve these positive outcomes.

Therefore, this study adopted De Noble, Jung, and Ehrlich's (1999) six-sub scales that measures the ESE. The first factor, *developing new product or market opportunities*, includes a set of skills related to opportunity recognition. This skill would be particularly important for an academic considering the pursuit of a spin-off firm. (Krueger, 1999, Chen, et al., 1998; Chandler & Jensen, 1992). The second factor, *building an innovative environment*, refers to the scholar's capability to encourage others to try new ideas, initiate novel actions, and take responsibility for their own outcomes. The dimension extends to evaluating the academic's perceived capability to foster innovative actions among other faculty members of the founding team. The third factor, *initiating investor relationships*, involves obtaining sufficient funds to capitalize the spin-off firm (Ehrlich, et al., 1994). This kind of networking activity is an important part of what an academic must do to realize and sustain the vision. The fourth factor, *defining core purpose*, serves to clarify and focus the scholar on the essential vision that their proposed company will need to attract key management personnel, employees, and investors. If an academic believes that

he/she is not capable of settling on a core purpose, it is unlikely that they will feel motivated to initiate a startup venture. A focus on the vision and values of the company was reported to be a critical skill by high-growth academic entrepreneurs in the research conducted by Eggers, et al. (1994). The fifth factor, *coping with unexpected challenges*, deals with the ambiguity and uncertainty that encompasses the life of an academic entrepreneur. Transitioning from a stable position at the university or comfort of an existing company into a world of creation of spin-off firm requires someone to tolerate the lack of information, equivocal messages, and rejections that will be faced in the process. These types of hurdles will occur with feedback from potential investors, fluctuations in market conditions, requirements for cash infusions, and other similar issues. The sixth factor, *developing critical human resources*, represents the ability of the academic entrepreneur to attract and retain key individuals as part of the venture. A scholar considering starting a spin-off firm recognize the need to involve others in the creation process. Believing that one has the capability to attract and retain talented professionals is an important component of startup activities. This human resources component has also been found to be a critical self-reported skill of high-growth entrepreneurs in the Eggers, et al., (1994). Therefore, these six dimensions are important in this study and more particularly in measuring the academic's perceived ESE and it's their ability to predict successive entrepreneurial intentions.

### **2.3.3 Personal and Professional Networks**

Perhaps one of the most important tools of the academics in creation of university spin-off firms, is the personal and professional networks—conduits for information, influence, goods and services. A social network is a matrix of individuals connected by a particular

kind of relationship - e.g. kinship, friendship, neighborhood, an activity. The individual belongs to any number of networks, which may overlap to varying degrees. Networks are characterized not only by their members and the connections between them, but by the resources that flow through these connections, and by the norms that govern the flow of the resources. Similarly Kogut (2000) observes that network is a connection between resources with the same purpose that interacts formally and informally, exchanging valuable knowledge that can be beneficial for those engaged. This is based on the fact that people and organizations interact with each other from time to time. By communicating with each other, they form a network that consists of links that connect them. These connections in the network can be strongly or weakly linked.

According to Uzzi and Spiro (2005), the strength of the network depends on the amount of links an actor has with other actors and those who are also related with them. The main goal of network is to create a shared value between several actors that can be beneficial for them. Since business information is shared and collaborated it creates collective intelligence and the information is more valuable than the sum of its parts. Second, it can open and speed up access to markets for the actors involved. The disadvantages, however, that it can be costly, since investing in network need significant amount of time and money. Because of the overlap of personal and academic networks, a good deal of personal information flows in academic networks, and a good deal of academic information flows in personal networks. It is for this reason that one cannot afford to be ignorant of personal ties, but also, and more important, personal networks become a key locus for the flow of professional resources.

By combining personal with professional ties, the academic maximizes his or her servicing efforts, as professional resources get exchanged in personal encounters. The fact that professional resources get exchanged in personal encounters creates an ecology in which information of professional importance, by virtue of spreading in informal and private situations, may never come up in public situations

Moreover, the competitors in the industry can use the shared knowledge from the network in a competitive way by focusing on their own interest which is a common fear in formal networks. That is why formal networks can be bounded by rules and contracts that structure the network, while also trying to control and coordinate the information and network structure. These rules and contract create the more formal form of network. Formal network is typically vertical, follow rigid chain of command, and relies on leaders that manage the interaction. Moreover, the network members usually have closer relationships that are sometimes tied by contracts and rules and strongly characterized by 'give and take' relation.

Informal networks are less rigid than the formal networks and don't always have strong ties or contracts imposed. The informal network allows its members to move in any direction, skip authorities, and is more socially structured. Their effectiveness varies considerably and are hard to manage. These networks believe in the sharing of information and knowledge and are characterized by its asynchronous reciprocity. Therefore, in this study, personal and professional networks will be examined through;



*personal/private/informal collaborations* (immediate personal environment consisting of family members and close friends); *Professional/ formal collaborations* (commercial exploitation of technology or knowledge through patenting, spin-off and licensing) and *research-related/non-formal collaborations*.

#### **2.3.4 Co-operation with the Industry**

Co-operation between universities and industry is defined in different ways. In this study, co-operation will be described as the link between basic research (which is usually located in universities, laboratories and research centres) and applied research (which tends to be located in industry and private applied research institutes or technology centres) that leads to creation of new ventures that increase the economic and technological potential of a country and at the same time improve the level of national competitiveness (Guerras-Martin et al., 2003; Mora-Valentin, 2002).

Numerous empirical findings state that this co-operation is important to generate innovations and to improve the competitiveness of any industry (Chen, 1994; Geisler, 1993; Kaufmann and Tödting, 2001; Mansfield, 1995), while addressing social and technological changes (Ahn, 1995). Cassier (1999) considered this cooperation as a way for technical and economic coordination between different actors – both state and private – that link science, technology and market. For Forrest and Martin (1992), it is a technological co-operation where firms support the study of the universities.

Autio et al. (1996) observed universities and industry work together due to; financial, technological, strategic, educational and political motivations goals. For *financial*; it is

through the access to additional financial sources as well as state grants. *Technological*; access to teams, materials and experience of the employees in the firms. *Educational*; receiving some training in the firm and the mobility of the firm staff and furthermore *political*; adaptation to the governmental initiatives. *Strategic*; access to strategic resources of the firm, improvement of the image and prestige of the universities, citations, publications in specialized journals, doctoral dissertations, research projects and the presentation of research results at conferences and workshops also push universities to work jointly with industry. Further analysis provided a ranked set of reasons or motivations for universities cooperating with industry. In this case, the main motivations are finding additional and alternative financial sources (Autio et al., 1996; Fritsch and Schwirten, 1999; Hall et al., 2000; Schmoch, 1997), the improvement of image and reputation (Lopez-Martinez et al., 1994; Siegel et al., 1999; Wallmark, 1997), the access to the firm's technology, knowledge and experience (Autio et al., 1996; Fritsch and Schwirten, 1999; Schmoch, 1997) and the securing of public subsidies. Moreover, the dispersion with respect to average values confirms these results because these four reasons present the lowest values for the dispersion coefficient.

### **2.3.5 Opportunity Identification and Recognition**

Eckhardt and Shane (2003) define entrepreneurial opportunities as situations in which new goods, services, raw materials, markets, and organizing methods can be introduced through the formation of new means, ends, or means-ends relationships. Opportunity recognition corresponds to the principal activities that take place before a business is formed or structured (Fletcher, 2006; Hill & Stewart, 2000). The opportunity identification stage can be divided into five main steps namely getting the idea/scanning the

environment, identifying the opportunity, developing the opportunity, evaluating the opportunity and evaluating the team (Gartner et al, 1999; Ardichvili et al, 2003).

*In getting the idea/scanning the environment;* Robertson et al (2003) argue that there is a strong link between getting the initial idea and the starting of the new enterprise. Rwigema & Venter (2004:159) define an idea as simply the conception of a possibility and a reflective method of evading, circumventing or surmounting obstacles and challenges. The *Oxford Dictionary* defines an idea as 1. A thought or suggestion about a possible course of action. Synonymous with “idea” are the terms thought, intention, scheme, suggestion, proposal, initiative, spur, impulse, brainwave, insight, concept and connotation (*Oxford*, 2015). Since ideas are many, developing the idea into a market opportunity, implementing it and building a successful business around it are the important aspects of entrepreneurship (Bygrave, 1997; Lumsdaine & Lumsdaine, 1995). A market opportunity is a gap left in a market by those who currently serve it, giving a chance to others to add unrealized value by performing differently from and better than competitors in order to create new possibilities (Wickham, 2001). The *Oxford Dictionary* (2015) defines opportunity as a favourable time or set of circumstances for doing something. Synonymous with opportunity are chance, opening and prospect. Timmons (1999) cautions that while business opportunities are detected from ideas, an idea is not synonymous with opportunity. The difference between an idea and an opportunity is that an opportunity is the possibility of occupying the market with a specific innovative product that will satisfy a real need and for which customers are willing to pay (GEM,

2003). McCline et al (2000) conclude that successful venturing may well rest upon the ability to recognize or distinguish an opportunity from an idea.

*Opportunity identification;* Kirzner (1973) advocated a theory of entrepreneurial alertness, describing it as the entrepreneur's ability to see, to discover and exploit opportunities that others miss. Hisrich & Peters (2002) noted that this is a very difficult task, as most opportunities do not just appear but rather result from an entrepreneur's alertness to possibilities. Markman & Baron (2003:289) lists steps involved in opportunity identification to include scanning the informational environment, being able to capture, recognize and make effective use of abstract, implicit and changing information from the changing external environments. Man et al (2002) adds that opportunity identification is basically seeking out better ways of competing. For *Opportunity development;* Morris & Zahra (2000) argue that having recognized the opportunity, timely adaptation of that opportunity to suit actual market need is key to new venture success. Kodithuwakhu & Rosa (2002) defines opportunity development as the process of combining resources to pursue a market opportunity identified. Markman & Baron (2003) conveys that this involves systematic research to refine the idea to the most promising high potential opportunity that can be transformed into marketable items.

During *Opportunity evaluation;* Ucbasaran et al (2004) declare that a critical element of the entrepreneurial process is the opportunity screening and evaluation. Hisrich et al (2005) affirm that a professional executed evaluation can tell whether the specific product or service has the returns needed to justify the investment and the risk to be taken.

According to several authors (Timmons, 1999; Rwigema & Venter, 2004; Gartner et al, 1999; However, in *Assessment of the entrepreneurial team*; Regardless of how right the opportunity may seem to be, it will not make a successful business unless it is developed by a team with strong skills (Bygrave, 1997). Gartner et al (1999) advises that once the opportunity has been evaluated, the next step is to ask pertinent questions about the people who would run the company.

### **2.3.6 University Contextual Elements**

Economic, political and cultural climate, administrative complexities, physical and institutional infrastructure can be regarded as environmental factors that might have an impact in academic entrepreneurial intentions (Kristiansen & Indarti, 2004). General economic environment is the availability of entrepreneurial opportunities and risks associated with them (Venkataraman, 1997). In addition, environmental conditions such as access to venture funding, government regulations, and closeness to markets is seen as attributes of the opportunity or business idea. Remarkably, commercializing a new invention might be easier in an environment (region) with many potential customers. Individuals in other environments may, however, not consider the same invention to be an entrepreneurial opportunity at all. Hence, the external environment affects which opportunities are created and pursued.

### **2.4 Empirical Review**

This section presents a thorough review of literature on the topic. The review revolves around the relevant variables as postulated from the theories. Dependent variable (DV) was Creation of University Spin-Off Firms (CUSOF/TTP); the independent variables (IV) were; Entrepreneurial Self-Efficacy (ESE), Personal and Professional Networks (PPN)

and Co-operation With Industry (CWI) and moderating variables (MV) were Opportunity Identification and Recognition (OIR) and University Contextual Elements (UCE).

#### **2.4.1 Creation of University Spin-Off firms**

Before delving in the various past studies on creation of university spin-off firms, it is important to admit that there is no common definition of ‘university spin-offs’ so again the process of establishing them. The term is used rather loosely and refers generally to any new, small, high technology or knowledge intensive company whose intellectual capital somehow has originated at a university (Sætre et al., 2009). In fact the meaning differs between countries, and half of the Organization for Economic Cooperation and Development (OECD) countries do not even have an official definition. Although the definitions vary, they all include one or more of the five different types of firms (OECD, 2001): (1) Any new firm which includes a public sector or university employee as one of the founders; (2) Any new firm which license technology from a university or public research institute; (3) Any new firm which includes a student or alumni as one of the founders; (4) Any new firm that started in an incubator or technology park affiliated with the public sector or a university; (5) Any new firm in which a university or national laboratory has made an equity investment.

In summary, the research study definition of a ‘university spin-off firm’ one whose:

*(1) the founder was a faculty member, staff member, or student who left the university to start the company or who started the company while still affiliated with the university, and/or (2) a technology or technology-based idea developed within the university was used to start the company (Smilor, Gibson, & Dietrich, 1990)*

Therefore to borrow from the words of Danhoff who in 1949 wrote that, "Entrepreneurship is an activity or function and not a specific individual or occupation.....the specific personal entrepreneur is an unrealistic abstraction". It imperative to state that, in this research; creation of university was seen through 'A stage model of academic spin-off creation' postulated by Nlemvo, Fabrice, & Bernard (2002).

William (1985) described the conceptual framework for describing the phenomenon of new venture creation. The researcher observed that new venture creation was a complex phenomenon: entrepreneurs and their firms vary widely; the actions they take or do not take and the environments they operate in and respond to are equally diverse - and all these elements form complex and unique combinations in the creation of each new venture. The researcher presented a framework for describing the creation of a new venture across four dimensions: (a) individual(s)-the person(s) involved in starting a new organization- in our case is the academic (staff or student); (b) organization-the kind of firm that is started-in the study is the university spin-off firm (c) environment-the situation surrounding and influencing the new organization-in the study is the- university context; and (d) new venture process-the actions undertaken by the individuals) to start the venture-in the study it is the four stages.

Nlemvo et al. (2002) developed a general model on academic spin-off creation that put forward the major issues involved in the transformation of research results into the creation of economic value within the perimeter of universities. The study identified and expounded on the key issues affecting the creation of firms arising from both public and

academic institutions. The research was done between February and July 1999 relied on a two-step approach; first, they identified and analyzed some well-known international spin-off support programmes located within 15 universities; second, used their observations to build up a general model that set out the major issues involved in the transformation of research results into the creation of economic value within the universities. Hence the model is composed of four successive stages interacting in a sequential manner; stage (1) to *generate* business ideas from research; stage (2) to *finalize* new venture projects out of ideas; stage (3) to *launch* spin-off firms from projects; stage (4) to *strengthen* the creation of economic value by spin-off firms (Nlemvo et al., 2002).

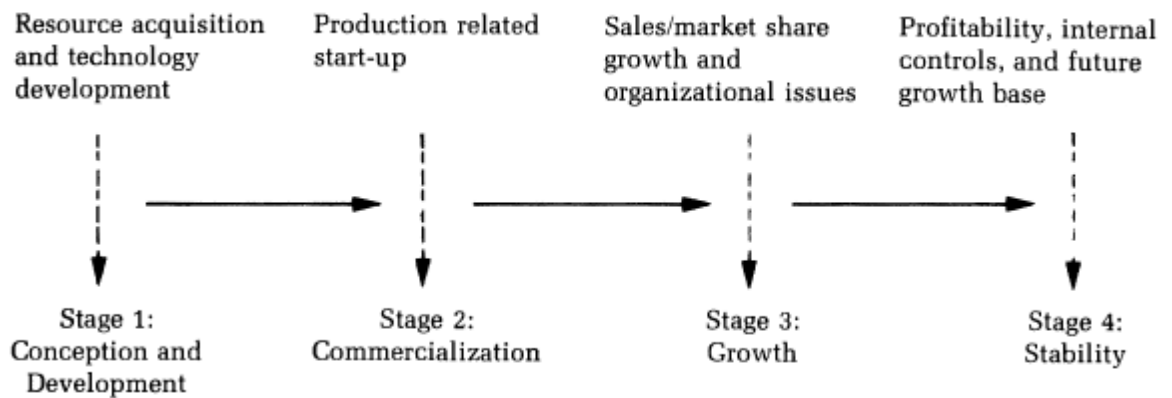
Vohora, Wright and Lockett (2004) studied on critical junctures in the development of university high-tech spin-out companies. They used a case-based research method to investigate the development of university spinout companies (USOs). The findings showed that there are two important elements in their development; first, USOs passes through a number of well-defined phases of activity in their formation. Each new venture must successfully go through the previous phase in order to progress to the next one but each phase involves a repetitious but not linear process of development in which occasionally there may be a need to revisit some of the earlier decisions and activities; second, at the spaces between the different phases of development the researchers found that spin-off firms face “critical junctures” in terms of the resources and capabilities they essentially require in order to move to the next phase. Just like, William (1985) argued that each of the distinct phase is critical as fundamentally the spin-off firms cannot develop into the next phase without closing in for each of the junctures. In the study, four different



critical junctures that university spin off companies need to conquer if they are to succeed; (1) opportunity recognition, (2) entrepreneurial commitment, (3) Threshold of credibility and (4) Threshold of sustainability (Vohora et al., 2004). Sætre et al. (2009) observe that the two studies by Vohora et al. (2004) and Nlemvo et al. (2002) are in many ways complement one another since the former focuses on the stages themselves while the later concentrates on the on transitions.

Kazanjian (1988) investigated on the relation of dominant problems to stages of growth in technology-based new ventures. The researcher employed multi method on two case studies to examine the growth patterns of technology-based startups. Sixty (60) managers and other employees were interviewed at 2 manufacturers of computer-based office products, located in Pennsylvania and Florida. Four primary patterns of association are investigated, using responses to 105 questionnaires sent to a portfolio of firms in 1982. The study propagated a 4- stage model (see Figure 2.3) ; (1) conception and development- the venture go through a period during which the primary focus of the entrepreneur and possibly of several others is on the invention and development of a product or a technology; (2) commercialization – the major focus is on developing the product or technology for commercialization that is beyond prototype ; (3) growth – the where the product that enjoys technical feasibility, experiences high sales (4) stability-the growth rate slows to a level consistent with the market growth applicable only to specified organizations. In order to establish validity of this stage-of-growth model, an analysis is done in relation to dominant problems at each stage. Types of problems include resource acquisition and technology development (stage 1), vendor relations and production start-

up (stage 2), growth of sales and market share (stage 3), profitability and internal controls (stage 4). In a nutshell, the results indicated that specific dominant problems are linked to each stage of growth. Importantly, problems and stages of growth do overlap, but there is also some support for a predictable pattern of problems faced by a firm as it grows (Kazanjian, 1988).



**Figure 2. 3 Relation of dominant problems to stages of growth**

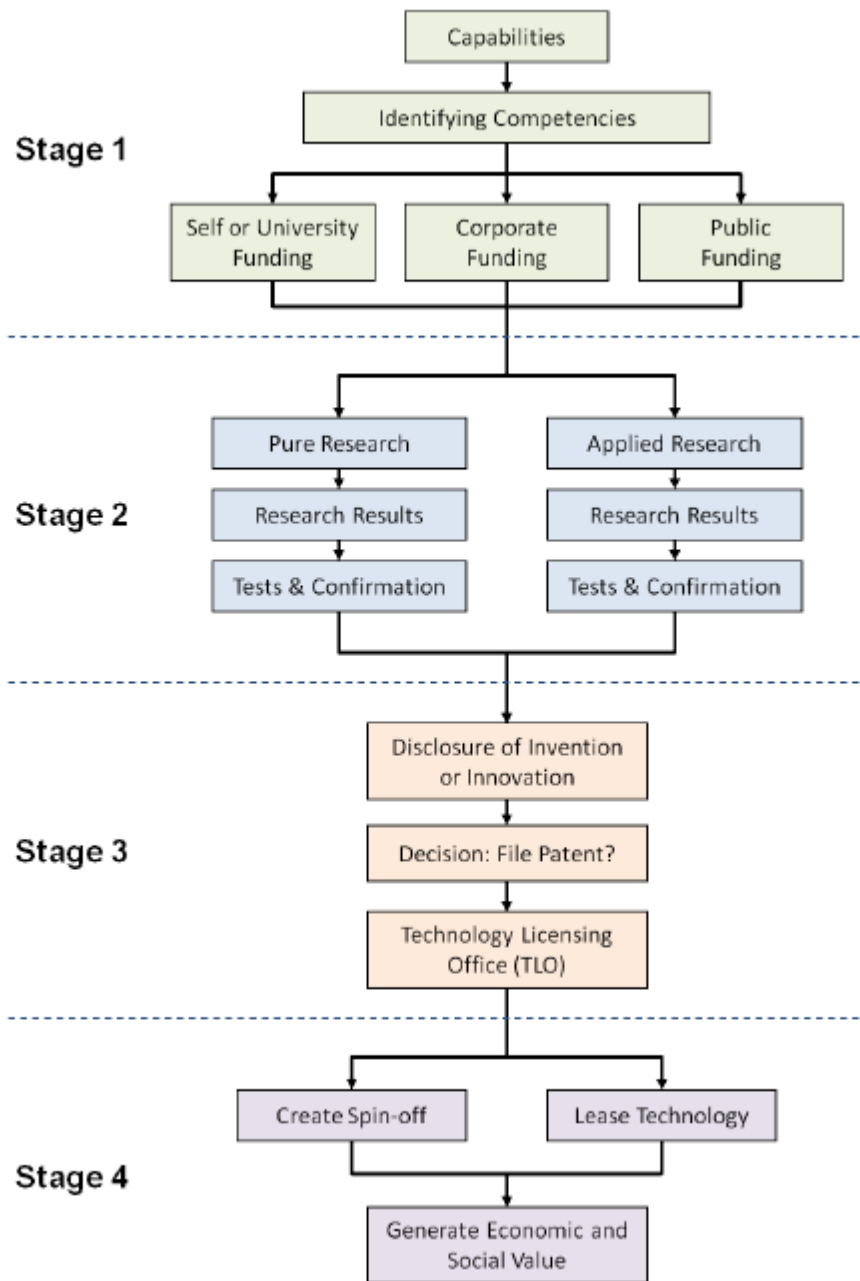
**Source: Adapted from Kazanjian (1988)**

Pattnaik and Pandey (2014) used their study to answer three questions that are often asked in the development of any phenomenon: *what, why, and how*; "What is a university spinoff?" and examine definitions from the literature; "Why is there a need for university spinoffs?"; "How are university spinoffs created?" the researchers propose their own multi-stage model after careful examining various other models that address the question. The general consensus just like earlier studies was that there is a need for an improved model that could highlight various phases that lead to the creation of a university spinoff (Pattnaik & Pandey, 2014). Hence, in Figure 2.4, the duo addressed this concern by

presenting a 4-stage composite model– showing the process from the identification of capabilities to the disclosure of invention to the final decision of creating a spinoff.

In the model, Pattnaik and Pandey (2014) portended that capabilities appears in Stage 1, making it the preconditions to creation of university spin-off firms.

It was argued that capabilities broken down into competencies are fundamental determinants of creating market viable technology spinoffs with the finances specifically singled out as the most central. It should be noted that research can be funded by the individual academics, the university or by corporate or public entities. Stage 2, described the nature and type of researches that suits the particular spin-off; pure or applied. Importantly, whether pure or applied, the results are tested and confirmed for reliability, validity, and viability. This allows the academic to analyze the opportunity ready for commercialization. In stage 3, terms and conditions of funding permitting, the university or innovator to discloses an innovation. The concerned parties are required to a make decision on whether or not to file a patent. Finally in stage 4, economic and social value is created through university spinoffs that gives returns in form of financial gains to the academic and university (if the university holds equity), job creation, and economic development (Pattnaik & Pandey, 2014).



**Figure 2. 4 A multistage holistic model for creating university spinoff firms**

**Source: Adapted from Pattnaik and Pandey (2014).**

According to Shane (2004), there are five typical stages followed in creating a spin-off firms. The first stage is purely academic but it allows for unrelated technologies that have

the potential to facilitate new products and services. In cases where the researcher believes that their new technology is an invention that can be commercialized, they then disclose it to the university's technology-licensing office. Then, in the third stage, the potential for intellectual property protection is evaluated and a patent application may be made. Based on the limited monopoly via the patent, the technology transfer office can either license the technology to an established company or the researcher may establish a spin-off firm.

#### **2.4.2 Entrepreneurial Self- Efficacy**

In a study, Naktiyok, Karabey and Gulluce (2010) investigated the relationship of entrepreneurial self-efficacy (ESE) and entrepreneurial intention in the Turkey. Using a sample of 245 undergraduate students from Faculty of Economics and Administrative Sciences at Ataturk University in the 2006–2007 academic year data was gathered through a questionnaire survey. This research findings revealed results in terms of the socio-psychological view for entrepreneurship. The results showed that there is a positive relationship between entrepreneurial intention and ESE; meaning that the concept of self-efficacy warrants more attention in entrepreneurship research. From the study, cultural characteristics did not foster entrepreneurship, but it moderated the high relationships between dimensions of ESE and entrepreneurial intention. The study indicated that in Turkey, the other factor that influences entrepreneurial decision may be the policies of national institutions that standardize new business start-ups. These establishment might slow down or undermine the entrepreneurial process because of their highly bureaucratic nature. The individual might believe that s/he is capable of executing actions required for launching a new venture; but he might also be convinced that he is not capable of overcoming the barriers of the legal proceedings. The outcomes of the study were

compared with a previously published study conducted in the USA and Korea by a group of researchers. In this comparison, the national cultural context was considered as an influential factor in entrepreneurship (Naktiyok et al., 2010).

Pihie and Bagheri (2013) explored the relationship between university students' entrepreneurial self-efficacy, self-regulation and entrepreneurial career intention and the mediating impact of self-regulation on the relationship between the variables based on a structural path model recently proposed by Bandura (2012). The study was composed of 722 public and private Malaysian university students. The results revealed that students' entrepreneurial self-efficacy has the most significant and positive impact on their intention to become an entrepreneur. The findings provided empirical evidence for the hypothesized relationship between self-efficacy, self-regulation and behavior in educational settings and more particularly relating to Malaysian university students' entrepreneurial intentions. The findings study revealed that domain-specific self-efficacy has the most significant positive effect on entrepreneurial career intentions among university students (Bandura, 2012; BarNir, Watson, & Hutchins, 2011; Culbertson, Smith, & Leiva, 2010; Fayolle et al., 2006; Zhao et al., 2005).

On the other hand, self-regulation also had a significant and positive impact on students' selection to establish their own venture. This finding supports the influential effect of self-regulation on students' intentions to become an entrepreneur (McMullen & Shepherd, 2002). Therefore, students' entrepreneurial intentions can be enhanced through improving their motivation to choose establishing their own businesses as their career path goal and enabling them to face the inherited challenges of a new venture creation process.

Furthermore, self-efficacy emerged as the most significant contributor to students' entrepreneurial intention because of its strong direct and indirect relationships with the construct. These highlights self-efficacy as the strongest factor influencing students' selection as an entrepreneur and necessitates providing opportunities for them to improve their entrepreneurial self-efficacy (Bandura, 2012; Culbertson et al., 2010; Fayolle et al., 2006; Souitaris et al., 2007; Wilson, Kickul, & Marlino, 2007; Zhao et al., 2005). This study investigated the relationship between entrepreneurial self-efficacy, self-regulation and entrepreneurial intention using Bandura's structural path model for the constructs.

Chen, Greene and Crick (1998) undertook two studies in order to establish differentiated entrepreneurial characteristics between entrepreneurs from managers, hence, they carried out the studies; one on students and the other on small business executives. In the first study; the authors found out that the total ESE score differentiated entrepreneurship students from students of both management and organizational psychology, and that across the three types of students, ESE was positively related to the intention to set up one's own business. In addition, the study revealed that entrepreneurship students have higher self-efficacy in marketing, management, and financial control than the management and psychology students. In the second study; the researchers investigated the effects of ESE and locus of control on the criteria of founders vs. non-founders of current businesses. It was revealed that the effect of ESE scores was significant, but the effect of locus of control was not. More exactly, it was found that business founders had higher self-efficacy in innovation and risk-taking than did non-founders.

Overall, Chen et al.(1998) argued that ESE is a fairly stable belief and it requires systematic and continuous efforts to be changed. Two broad ways were suggested toward desired change; one is the micro-approach that directly emphasizes on people's beliefs. It advocates for designing and conducting entrepreneurship courses in universities that train students not only in critical entrepreneurial skills and capabilities but also strengthen their entrepreneurial self-efficacy. The second way is to improve on the environment of potential and actual entrepreneurs. According to the reciprocal causation model, the environment may affect self-efficacy not only directly but also indirectly through performance. Therefore, the universities should work toward creating an efficacy enhancing environment by making resources both available and visible, publicizing entrepreneurial successes, increasing the diversity of opportunities, and avoiding policies that create real or perceived obstacles (Chen et al., 1998).

Setiawan (2014) examined entrepreneurial self-efficacy among students where the researcher affirmed that ESE is important for a person to act to be an entrepreneur. From the study, the author examined the level of ESE among students from an Indonesian university drawn from International Business Management (56.82%), Visual Communication Design (21.6%), and Psychology (21.6%) and adopted entrepreneurial education in the curriculum. The sample of this study involved 199 undergraduate students who were in semester 4, who had been participating in the course of entrepreneurship for 4 semester. The study focused on ESE developed by De Noble et al. (1999) which consisted 6 dimensions. The results showed that overall the level of ESE among students was high. Based on the analyses of each dimension of Entrepreneurial Self-Efficacy,



defining core purpose and initiating investor relationships achieved the highest level, whereas coping with unexpected challenges scored the lowest level (Setiawan, 2014).

Drnovšek, Wincent and Cardon (2010) critically reviewed and identified gaps in current literature on ESE, provided a definition of ESE that addresses some of those gaps, and explored the role of ESE during the phases of a business start-up process. In the end, the study defined ESE using three sources of dimensionality. The first includes the particular aspect of entrepreneurship to which self-efficacy is applied, whether to business start-up or business growth activities. The second sources of dimensionality refers to the content of self-efficacy beliefs (task or outcome goal beliefs -assessments of one's capabilities to engage in activities that will lead to successful task or outcome completion during business start-up), and the third source to the valence of entrepreneurial self-efficacy beliefs (positive or negative control beliefs-are an entrepreneur's beliefs about his/her capabilities to control negative thoughts and bolster positive thoughts during goal pursuit)(Drnovšek et al., 2010).

In study by Hmieleski and Baron (2008), the researchers attempted to fill the gap in the literature by examining two possible moderators of the effects of entrepreneurial self-efficacy on firm performance: dispositional optimism and environmental dynamism. The study used a national random sample of 1,000 firms that was drawn from the Dun and Bradstreet Market Identifiers Database in USA. The findings indicate that these factors in indeed moderate the effects of entrepreneurial self-efficacy; in fact, a three-way interaction between self-efficacy, optimism, and environmental dynamism was observed

with respect to firm performance. Consistent with predictions, in dynamic environments, the effects of high entrepreneurial self-efficacy on firm performance were positive when combined with moderate optimism, but negative when combined with high optimism. In stable environments, in contrast, the effects of self-efficacy were relatively weak, and were not moderated by optimism. The authors interestingly noted in the conclusive results that the high self-efficacy is not always beneficial for entrepreneurs and may sometimes exert negative effects under some conditions. Without some expectation that negative outcomes might occur to keep such beliefs in personal efficacy in check, entrepreneurs attempting to lead their start-ups toward growth under rapid and unpredictably changing environmental conditions—especially entrepreneurs who are also high in dispositional optimism—may gradually move toward complacency, overconfidence, a tendency to assume excessive risk, and other ineffective strategies (Hmieleski & Baron, 2008).

#### **2.4.3 Personal and Professional Networks**

In a study by Fernández-Pérez, Alonso-Galicia, Rodríguez-Ariza, & del Mar Fuentes-Fuentes (2015), the authors investigate academics entrepreneurial intentions and how they are affected by the perception of support received through personal and professional social networks (including mentors, business networks and forums). Furthermore, the researchers analyze the mediator role of two relevant cognitive factors: entrepreneurial attitudes and self-efficacy. The hypotheses were tested using regression analysis, on a sample population of 630 Spanish academics. The findings found out that there are positive roles played by the perceived support of mentors and business and personal networks in promoting academic interest in new business ventures, and the fact that entrepreneurial attitudes and self-efficacy play significant mediator roles. Analysis of the

marginal effects of certain professional networks and of their lesser impact at a psychological level can produce interesting implications and insights, both for the academic world and for policy makers in this area (Fernández-Pérez et al., 2015).

Brüderl and Preisendörfer (1998) conducted interviews the at beginning of 1990 with a random sample of 1,849 business founders in Upper Bavaria (Germany) to establish the relationship between network support and the success of newly founded business. The empirical findings founded out that network resources, networking activities and network support are heavily used to establish new firms. In addition the results indicated that entrepreneurs who are able to connect to a broad and diverse social network and who receive much support from their network are more successful (network success hypothesis). The results further notes that the one social capital (network support) is used to compensate shortfalls of other types of capital (human capital and financial capital). This compensation hypothesis, however, does not find empirical confirmation. On the other hand, however, the network success hypothesis proved to be valid that is. network support increases the probability of survival and growth of newly founded businesses (Brüderl & Preisendörfer, 1998).

De Carolis, Litzky and Eddleston (2009) employed a sample of 269 entrepreneurs to establish why networks enhance the progress on new venture creation. Their research results found out that social capital is not the only determinant for new venture creation but the type of academic entrepreneur involved in network relationships matters. The empirical findings confirmed direct relationships between networks and new venture

creation where by having many network connections facilitates the building of new ventures. In addition, they found out that relational capital embedded in networks contributes to new venture progression as entrepreneurs rely on the support and information they receive from these relationships. Therefore, the research provided further support to the common perception that entrepreneurs with many contacts and greater accumulated resources and support from these contacts are better able to launch new ventures (De Carolis et al., 2009).

Ozgen and Baron (2007) investigated the effects on opportunity recognition of three social sources of opportunity-related information (mentors, informal industry networks, participation in professional forums). The results indicated that all three sources had direct, positive effects on opportunity recognition by entrepreneurs. In addition, the effects of two sources (mentors and professional forums) were mediated by schema strength, while effects of the third source (informal industry networks) were mediated by self-efficacy. The results were in line with theories of opportunity recognition that emphasize the role of information and cognitive processes and suggest that two social sources of information not systematically investigated in previous research—mentors and participation in professional forums—can assist entrepreneurs in identifying opportunities for new ventures (Ozgen & Baron, 2007).

Chell and Baines (2000) used quantifiable data from 104 owner-managers and qualitative data from 34 critical incident interviews from a study of microbusinesses to assess the nature and extent of networking activity to conclude that networking by owner-managers

of small businesses enhance business performance. They observed that a high proportion of owner-managers use their trading contacts as sources of useful additional information; they use 'weak ties' for purposes such as recruitment; a sparse use of institutional networks; an association between networking activity and business performance, although it seems that this must be qualified by sectorial differences; an association between type of owner-manager on a scale of entrepreneurship and networking activity (Chell & Baines, 2000).

Witt (2004) conducted a study to investigate how entrepreneurs' networks influences the success of start-ups'. The results concluded that network success hypothesis assumes a positive relation between the networking activities of founders and their start-up's success. The rationale behind this hypothesis is the theory of socially embedded ties that allow entrepreneurs to get resources cheaper than they could be obtained on markets and to secure resources that would not be available on markets at all, e.g. reputation, customer contacts, etc. The study suggested how entrepreneurial network activities could be measured and which indicators exist to quantify start-up success. It provided a new, extended model for the relation between entrepreneurial networks and start-up success (Witt, 2004).

#### **2.4.4 Cooperation With Industry**

Birley (1986) argued that interaction with industry is indispensable in order to: assemble relevant information about the new business, seek external support and services, find external resources, publicize the new company, and to search for business advice. Several empirical findings on university-industry relations indicates that institutions with closer

connections to industry produce a greater number of spin-offs and show more entrepreneurial activity, such as academics consulting with industry, faculty involvement in new firms, and faculty and university equity participation in start-up firms (Cohen, Florida, Randazzese, & Walsh, 1998; Malonet & Roberts, 1996).

Grandi and Grimald (2005) research hypothesized about the organizational characteristics (articulation of roles, communication and networking, market orientation of research groups, and prior joint experience) of startups and tested on a sample of 42 Italian academic startups. Public data were collected and supplemented with information supplied by professors, researchers, scientists, and colleagues of spin-offs. The research findings empirically supported the existing theories about the importance of academics combining different outside knowledge that need to be accessed through cooperation with industry. This is arises in a situation when a combined knowledge of the entrepreneurial academic team is incomplete, the research intellectuals are more likely to interact with external agents such as industry partners to complement. While on the other hand academics are pressed upon to be familiar with market requirements that are in tandem with their own research (Grandi & Grimaldi, 2005).

Freitas, Marques, and e Silva (2013) investigated on the role of university–industry co-operation for the development of innovation in mature and emergent industries in new industrialized countries. Data from 24 research groups in science and engineering departments in universities and public research organizations in Brazil was used to provide

a preliminary empirical corroboration for the proposal that the contexts and role of university–industry co-operation in mature and emergent industries are diverse. They found out that knowledge networks are underdeveloped in emerging industries and therefore public support for research projects was dispersed hence. However, in mature industries there was elaborate academic initiatives and public calls for research projects that at times attracted full funding from major public research sponsors. In addition, in emergent industries, the role of academic and firm employees was seen to very important for mediating between public research organizations and companies (Freitas et al., 2013).

Abramo, D’Angelo, and Di Costa (2011) researched on university-industry research co-operation with emphasis on assess university capabilities. They employed an econometric model which pointed out the university capability for co-operation with industry was a function of size, location and research quality. The data was gathered from bibliometric census observed as proxy (more than 1,500 publications, representing a total of almost 2000 university industry co-operations in the 2001–2003 triennium in Italy), this guaranteed a level of significance that cannot be reached through sample-based surveys. The investigations indicated that research quality of universities has an impact higher than geographic distance on the capability for collaborating with industry. In conclusion, the model proposed and course of actions that originate from it are suited for use at various levels of administration, to ensure that it realizes the “third role” of universities: the contribution to socio-economic development through public to private technology transfer (Abramo et al., 2011).

Brunel, d'Este, and Salter (2010) investigated on factors that diminish the barriers to university-industry co-operation. The results indicated the influence of diverse instruments that can be used to pull down the barriers related to the orientation of universities and to the transactions involved in work with university partners. The research engaged a large-scale survey and public records thereby showcasing the effect of co-operation experience, breadth of interaction, and inter-organizational trust. To the end, the analysis supported the assertions that prior experience of collaborative research lowers orientation-related barriers; greater levels of trust co-operation barriers; and breadth of interaction diminishes the orientation-related, but increases transaction-related barriers (Bruneel et al., 2010).

Blumenthal, Causino, Campbell and Louis (1996) studied on relationships between academic institutions and industry in the life sciences using a survey method on representative sample in the United States. Data was collected by telephone from May-September 1994 from senior executives of 210 life-science companies (of 306 companies surveyed; response rate, 69 %). The results were that 90% of companies carrying out life science research in the United States had co-operations involving the life sciences with an academic institution in 1994. 94% gave fund for research in such institutions, hence an estimated \$1.5 billion, or approximately 11.7 % of all research-and-development monies received that year. The partnerships with universities tended to be short-term and involve insignificant amounts, implying that most such relationships supported applied research or development. Over 60% of companies providing funding for life-science research in



universities had received patents, products, and sales as a result of those collaborations (Blumenthal, Campbell, Causino, & Louis, 1996).

Montoro-Sanchez, Mora-Valentin and Guerras-Martin (2006) studied 800 collaborations in Spain (1995–2000). Using descriptive analysis they analyzed a set of Spanish cooperative agreements in R&D activities between firms and Research Organizations (RO), including universities, public research centres and private institutes or associations. The results indicated that cooperation between firms and RO is not yet the general pattern of behaviour in Spain for technological activities. The average duration of these cooperative agreements is 22.6 months. However, the most significant reasons for firms to cooperate are strategic, especially those linked with the improvement of competitive advantage and thus strategic reasons are clearly more important than any other (Montoro-Sanchez et al., 2006).

Landry, Amara and Rherrad (2006) research responded to the following question: why are some university researchers more likely to create spin-off companies than others? In a bid to explain this, the researchers reflected on the resource-based theory of the firm. The sample consisted of 1554 university researchers funded by the Natural Sciences and Engineering Research Council of Canada (NSERC). Using the logistic regression, the findings recommended that the traditional and entrepreneurial visions of university research complement each other when an academic evaluates the resources mobilized by researchers to launch spin-offs. Furthermore, they argued that academics are in dynamic consulting activities with private firms, government agencies, or organizations associated

within their research have the high plausibility to engage in spin -off creation themselves (Landry et al., 2006).

Gulbrandsen and Smeby (2005) looked at the industry funding and university professors' research performance. They hypothesized that while on one hand University research was on an increasing extent funded by industry on the other hand the share of basic funding was decreasing. Using data from a questionnaire study among all tenured university professors in Norway ( $N = 1967$ ) the study found out that there is a significant relationship between industry funding and research performance meaning that academics with industrial funding describe their research as commercially viable. Besides, they co-operate more with other researchers both in academia and in industry on various engagements and ultimately they report exceeding scientific publications and at the same time as numerous entrepreneurial results (Gulbrandsen & Smeby, 2005).

#### **2.4.5 Opportunity Identification Recognition**

Two differing perspectives in entrepreneurship are whether opportunities are of a Schumpeterian or Kirznerian type (Shane & Eckhardt, 2003) . Adherents of the Schumpeterian perspective suggest that new information is important for entrepreneurship, and academic entrepreneurs' uses new information to recombine resources into more valuable forms (Schumpeter, 1934). In contrast, Kirzner (1997) argues that entrepreneurship is based on differing access to existing information. Both these perspectives may help to explain the existence of entrepreneurial opportunities (Shane and Venkataraman, 2000).

Generally, a university spin-off firm is at least partly, relying on the Schumpeterian type as it is established to exploit new research results. There is also a debate whether opportunities within the universities are discovered (Shane and Venkataraman, 2000), or if opportunities under many circumstances are enacted (Gartner et al., 2003). The latter view emphasizes that opportunities are not objectively existing and static, but are developed throughout the entrepreneurial process. The opportunity may start out very vague, but be developed into a more articulated business idea, and finally become the core business for the new venture.

Hannibal, Evers and Servais (2016) examined opportunity recognition process and international new venture emergence in the context of university high technology spin-offs that are internationally market driven from inception. The researchers imported theory from the entrepreneurship literature on organizational emergence, opportunity recognition, effectuation and the principle of individual self-efficacy. Drawing on empirical case data from four cases about University Spin-Outs (USOs) from Denmark and Ireland, the researchers observed that founders or inventors are typically engaged in opportunity recognition processes that are characterized as creative, driven by scientific innovations. The results suggested that the founder's activities and interactions are considered pivotal in driving the opportunity recognition process leading to international new venture emergence. It is indicated that the process of USO emergence and continuous development involves activities and interactions similar to typical international new ventures. The scientific knowledge that created opportunities for the emergence endorsed the view that innovation and internationalization are strongly correlated. In addition, the

results highlighted that self-efficacy of the inventor or founder(s) and access to specific resources (means at hand) are key determinants for international new ventures to materialize.

Ardichvili et al. (2003) built on existing theoretical and empirical studies in the area of entrepreneurial opportunity identification and development. The researchers utilized Dubin's theory building framework to propose a theory of the opportunity identification process. They identified entrepreneur's personality traits, social networks, and prior knowledge as antecedents of entrepreneurial alertness to business opportunities. In particular entrepreneurial alertness was singled out as the necessary condition for the success of the opportunity identification triad: recognition, development, and evaluation. Alertness is likely to be heightened when there is a coincidence of several factors: certain personality traits (creativity and optimism); relevant prior knowledge and experience; and social networks. The particular activities within the process are also affected by the degree of specificity of knowledge about market needs and resources. Remarkably, the opportunity development process is cyclical and iterative: an entrepreneur is likely to conduct evaluations several times at different stages of development; evaluation could also lead to recognition of additional opportunities or adjustments to the initial vision (Ardichvili et al., 2003).

Bhave (1994) employed the process model of entrepreneurial venture creation to study twenty-seven business in a range of industries in upstate New York. Using interviews, the researchers described it as an iterative, nonlinear, feedback-driven, conceptual, and

physical process of creating businesses. The model included internally and externally stimulated opportunity recognition, commitment to physical creation, set-up of production technology, organization creation, product creation, linking with markets, and customer feedback. Notably, the process was divided into the opportunity stage, the technology set-up and organization-creation stage, and the exchange stage. Bhave (1994) draws out two separate routes for opportunity recognition as the first incident that takes place in this stage. Mansour and Maliqi (2016) observed that when the decision to initiate a venture comes before an opportunity is recognized, this is labelled as “an externally stimulated opportunity recognition” path where the entrepreneur seeks out for opportunities that he/she comes across, makes a selection of an appropriate opportunity based on previous knowledge, expertise, as well as market conditions, “refines” the opportunity, and ultimately formulates a business concept . In an “internally stimulated opportunity recognition” path, an opportunity is first recognized when the entrepreneur seeks to create solutions to a need that is relevant to him/her and when the potential business value is recognized, a decision to create a venture is then made which would then also lead to a “refinement” of the opportunity, and then business concept development (Mansour & Maliqi, 2016).

Alvarez & Barney (2007) make comparisons of the discovery and creation theories for formation of entrepreneurial opportunities. Within the discovery theory, entrepreneurs are constantly scanning the environment for opportunities that come into existence as a result of external changes, and these opportunities are waiting to be uncovered as Kirzner explains by those “alert” entrepreneurs. On the other hand, creation theory asserts that an

opportunity is intrinsically related to the entrepreneur who is “exploring new ways to produce new products and services” and is then followed by a series of actions interacting with the market.

#### **2.4.6 University Contextual Elements**

Smilor et al. (1990) investigated the factors that improve and prevent the formation and development of spin-out companies from the university. It presented empirical data from 23 technology-based spin-out companies from the University of Texas at Austin. The data was based on a survey questionnaire that assessed a range of factors, including the role of the university in company formation and development, reasons for start-up and major difficulties facing spin-out companies. The research findings showed that the University of Texas at Austin has habitually played an important, albeit passive role in the creation and development of spin-out companies. Pull factors, such as recognition of a market opportunity, drive to try something new and desire to put theory into practice, are more important than push factors, or various forms of frustration with the university environment, in influencing the start-up of spin-out companies. However, institutional and behavioral changes indicate that the university is beginning to take a more proactive role in spin-out company establishment and development (Smilor et al., 1990).

Lockett, Wright and Franklin (2003) studied the strategies that universities use to promote the creation of spin-out companies and how they then manage the development of these companies. The empirical analysis was based on a comprehensive questionnaire survey of spin-out activity at 57 U.K. universities. The findings indicated that the more

successful universities have clearer strategies towards the spinning out of companies and the use of surrogate entrepreneurs in this process. In addition, the more successful universities were found to possess a greater expertise and networks that may be important in fostering spin-out companies. Finally, equity ownership was found to be more widely distributed among the members of the spin-out company in the case of the more successful universities. (Lockett et al., 2003).

Yıldırım and Aşkun (2012) looked at the entrepreneurial intentions of public universities in Turkey by exploring their strategic postures, cultural and organizational units that supplement and support entrepreneurial activities and collaborations. A qualitative content analysis was employed to establish the specific characteristics from the Web sites of public universities in Turkey in academic year of 2011-2012. The finding showed that majority of the public universities in Turkey does not emphasize entrepreneurship in their strategic statements; hence public universities in Turkey cannot be defined as ‘entrepreneurial universities’. It was concluded that entrepreneurial intentions of universities exemplified from their strategies, culture, institutional infrastructure, collaborations/partnerships. This interventions provide evidence about not only current but also potential entrepreneurial behaviors of public universities in Turkey (Yıldırım & Aşkun, 2012).

Fini, Grimaldi, Santoni and Sobrero (2011) investigated the role of universities and local context in supporting the creation of academic spin-offs. The study showed extent to which University-Level Support Mechanisms (ULSMs) and Local-Context Support Mechanisms (LCSMs) complement or substitute for each other in fostering the creation of academic spin-offs. Using a sample of 404 companies spun off from the 64 Italian Science, Technology, Engineering, and

Mathematics universities (STEM universities) over the 2000–2007 period. The results show that the ULSMs' marginal effect on universities' spin-off productivity may be positive or negative depending on the contribution offered by different LCSMs. In a particular given region, ULSMs complement the legislative support offered to high-tech entrepreneurship whereas they have a substitution effect with regard to the amount of regional social capital, regional financial development, the presence of a regional business incubator, regional public R&D expenses as well as the level of innovative performance in the region. Results support the idea that regional settings' idiosyncrasies should be considered for universities to develop effective spin-off support policies.

Ab Aziz, Harris and Norhashim (2011) studied the management of research, development and commercialization activities among Malaysian universities. The focus was on strategic orientation, structure and key initiatives employed to enable, drive and enhance the research, development and commercialization by the university. The results show that universities were identified as one of the key factors for the growth and development of a nation in terms of their capacity to produce innovation and start-up companies.

Swamidass (2013) investigated how university startups can be used as a commercialization alternative. By drawing examples from three contrasting case studies; MIT's case was example of long-term success, the University of Colorado's case was an example of medium-term success, and Auburn University's case was an example of a new-comer to the scene. The results showed that the creation of university startups requires personnel skills and programs not typically associated with a university Office of Technology Transfer (OTT). The study concluded that there is the need for very early evaluation of all inventions for their startup potential, the need for pre-license seed funds through proof-of-concept programs to advance early-stage inventions to the next stage,



and the need for OTT personnel skilled in enabling startups. Finally, the university need to put policies to turn some them to fuel university startups.

## **2.5 Critique of the existing Literature Relevant to the Study**

This section presents a thorough appraisal of the literature on the topic. The exposition revolves around the relevant variables as postulated in the conceptual framework.

### **2.5.1 Creation of University Spin-off firms**

The current study makes reference to among others, William (1985), Ndonzuau, Pirnay and Surlemont (2002), Kazanjian (1988) and Vohora, Wright and Lockett (2004) that used the various stage models to identify the numerous change of status that research results have to undergo to generate economic value; thus, ‘research results→business ideas→new venture projects→spin-off companies→economic value. Ndonzuau et al.(2002) conducted a research between February and July 1999 that relied on a two-step approach on international spin-off support programmes located within 15 universities to build up a general model that set out the major issues involved in the transformation of research results into the creation of economic value within the universities. Kazanjian (1988) employed multi-method on two case studies to examine the relation of dominant problems to stages of growth in technology-based new ventures. The researcher used sixty (60) managers and other employees from 2 manufacturers of computer-based office products, located in Pennsylvania and Florida. Vohora, Wright and Lockett (2004) used a case-based research method to investigate the critical junctures in the development of university high-tech spin-out companies.

Although, the current study adopts a modified Ndonzuau et al.(2002) model that comprises of four successive stages interacting in a sequential manner; stage (1) to generate business ideas from research; stage (2) to finalize new venture projects out of ideas; stage (3) to launch spin-off firms from projects; stage (4) to strengthen the creation of economic value by spin-off firms. It also integrates it with the Kazanjian (1988) that had both the four stages and the accompanying problems; (1) conception and development (2) commercialization; (3) growth (4) stability. Types of problems included resource acquisition and technology development (stage 1), vendor relations and production start-up (stage 2), growth of sales and market share (stage 3), profitability and internal controls (stage 4). In a nutshell, the results indicated that specific dominant problems were linked to each stage of growth. This allowed the researcher to focus on the process but at the same time not to put in the hindsight the hindrances that faces each stage. In fact, Ndonzuau et al.(2002) posits that the creation of spin-off firm process is neither straightforward nor spontaneous but has numerous obstacles, difficulties, impediments, hindrances, and other sources of resistance (hereafter called ‘issues’).

Similarly, Vohora, Wright and Lockett (2004) had four different critical junctures that university spin off companies needed to conquer if they were to succeed; (1) opportunity recognition, (2) entrepreneurial commitment, (3) Threshold of credibility and (4) Threshold of sustainability. The researchers observe that each new venture must successfully go through the previous phase in order to progress to the next one but each phase involves a repetitious but not linear process of development in which occasionally there may be a need to revisit some of the earlier decisions and activities. Just like William

(1985) and Ndonzuau et al.(2002) that mention occurrences of “issues” between the subsequent stages , Vohora et al.(2004) explains that the spaces between the different phases of development are “critical junctures” in terms of the resources and capabilities spin-off firms require in order to move to the next phase. Just like, William (1985) argued that each of the distinct phase is critical as fundamentally the spin-off firms cannot develop into the next phase without closing in for each of the junctures. William (1985) presented four dimensions: (a) individual(s)-the person(s) involved in starting a new organization- in our case is the academic (staff or student); (b) organization-the kind of firm that is started-in the study is the university spin-off firm (c) environment-the situation surrounding and influencing the new organization-in the study is the– university context; and (d) new venture process-the actions undertaken by the individuals) to start the venture- in the study it is the four stages. The elements in this model are what constitute an entrepreneurial process in the current study that leads to the creation of spin –off firms’ that is (a) academic entrepreneur (b) university spin-off firm (c) university contextual elements (d) creation of spin-off firm process. Therefore the researcher modifies Ndonzuau et al.(2002) and Kazanjian (1988) model to have 4 –stage model; Generate phase-originate a viable business idea (conception and development); Finalize phase-scan, evaluate and translate the idea into a business process (Commercialize); Launch phase-Create a firm (Growth) and Strengthen phase-Contribute value to customers, employees, investors and all other stakeholders (Stability).

### **2.5.2 Entrepreneurial Self- Efficacy**

Naktiyok, Karabey and Gulluce (2010) used a questionnaire survey to investigate the relationship between entrepreneurial self-efficacy (ESE) and entrepreneurial intentions in

the Turkey. With a sample of a sample of 245 undergraduate students (74 % response rate) from the faculty of economics and administrative sciences at Ataturk University in the 2006–2007 academic year. The unit of observation of undergraduate students studying business-related discipline is a common phenomenon in majority of studies. Pihie and Bagheri (2013) used 722 public and private Malaysian university students, a sample that was almost three times bigger than the case of Naktiyok, Karabey and Gulluce (2010), but in an expanded unit of analysis that was similar to current study of both private and public universities. Apart from most researches that covers Europe and US, Naktiyok, Karabey and Gulluce (2010) study was done in Malaysia, Asia. Naktiyok, Karabey and Gulluce (2010) used factor analysis to the 35 items of ESE measure using principal components analysis with varimax rotation so as to determine the dimensions. Similar to Hmieleski and Baron (2008); Pihie and Bagheri (2013); Setiawan (2014) and the current study, regression analysis was used to explain the direction of the relationship between the study variables. For instance, Naktiyok, Karabey and Gulluce (2010) used the regression model to explain relationship between ESE, an independent variable and entrepreneurial intention, as dependent variable. The researcher agreed with the this findings and others done in other parts of United States, Europe and other parts of Asia that showed that there is a positive relationship between entrepreneurial intentions and ESE but beyond particularly academics in Turkey's are influenced by entrepreneurial decisions from outside the universities internal environment that is policies from national institutions and culture that standardize new business start-ups (Bandura, 2012; Culbertson et al., 2010; Fayolle et al., 2006; Souitaris et al., 2007; Wilson et al., 2007; Zhao et al., 2005). To deepen and broaden the study on ESE, Drnovšek, Wincent and Cardon (2010) critically

reviewed and identified gaps in current literature on ESE, provided a definition of ESE that addresses some of those gaps, and explored the role of ESE during the phases of a business start-up process. This approach blends with the current study that focuses on the creation of spinoff firms that undergoes various stages with determinate ESE. Hence, the researcher agreed with the fact that ESE should be studied from multiple dimensions; where self-efficacy is applied in entrepreneurship, the content of self-efficacy beliefs and valence of entrepreneurial self-efficacy beliefs.

### **2.5.3 Personal and Professional Networks**

Fernández-Pérez, Alonso-Galicia, Rodríguez-Ariza, and del Mar Fuentes-Fuentes (2015) investigated how academics' entrepreneurial intentions are affected by the perception of support received through personal and professional social networks (including mentors, business networks and forums). The research is relevant to this current study and particularly to the second variable of the study. The research conducted a stratified sampling of 8489 Principal Investigators (PIs) from 52 Spanish public universities that resulted into a sample of 630 academics. Although the sample was adequate, then unit analysis was deemed biased simply because it focused on public leaving private universities out. Unlike Brüderl and Preisendörfer (1998) that used a random sample of 1,849 business founders in Upper Bavaria (Germany) and De Carolis, Litzky and Eddleston (2009) that employed a sample of 269 entrepreneurs, Fernández-Pérez et al.(2015) used only the academics. It is presumed that to effectively explain personal and professional networks then a unit of observation should blend academic and non-academics. The current study missed to employ a mixed data collection tool. Notably, Fernández-Pérez et al.(2015)

used a combined data collection of questionnaire and computer assisted-telephone interviews that were applicable when conducting corroborating findings, data triangulation or convergence. In congruence with other researches, before hypothesis testing and evaluating the models, the data used was tested to ascertain whether it met the assumptions required for regression analysis concerning linearity, homoscedasticity and normality. The test of multicollinearity among the independent variables produced tolerance values ranging from 0.623 to 0.960 and variance inflation factors (VIFs) ranging from 1.042 to 2.004 which was within the acceptable ranges of majority of the researches. Personal and professional networks was measured through formal, informal and non-formal networks which are exemplified in numerous studies. Fernández-Pérez et al.(2015) had mentors, business networks and forums as independent variables entrepreneurial attitudes and self-efficacy as mediating variables. Ozgen and Baron (2007) investigated the effects on opportunity recognition of three social sources of opportunity-related information (mentors, informal industry networks, participation in professional forums). Witt (2004) investigated how entrepreneurs' networks influences the success of start-ups'. De Carolis, Litzky and Eddleston (2009) established why networks enhance the progress on new venture creation. The empirical findings from most of the studies confirmed direct relationships between networks and new venture creation where by having many network connections facilitates the building of new ventures. In addition, network resources, networking activities and network support are heavily used to establish new firms. Although the researcher are in support with De Carolis, Litzky and Eddleston (2009) that social capital is not the only determinant for new venture creation but the type of academic entrepreneur involved in network relationships matters, the current hypothesizes the

opportunity recognition and university context elements play significant mediator roles in creation of university spin off firms.

#### **2.5.4 Cooperation With Industry**

Montoro-Sanchez, Mora-Valentin and Guerras-Martin (2006) examined 800 collaborations in Spain (1995–2000) that involved a set of Spanish cooperative agreements in R&D activities between firms and Research Organizations (RO). Just like the current study, Montoro-Sanchez et al.(2006) scope of study was expansive and it covered universities, public research centres and private institutes or associations covering 800 projects, 578 (72.2%) were completed, while the remaining 222 (27.8%) were ongoing projects. Unlike in Europe, Freitas, Marques, and e Silva (2013) used 24 research groups in science and engineering departments in universities and public research organizations in Brazil to investigate the role of university–industry co-operation for the development of innovation in mature and emergent industries in new industrialized countries. On the other hand, Landry, Amara and Rherrad (2006) used a sample that consisted of 1554 university researchers funded by the Natural Sciences and Engineering Research Council of Canada (NSERC) to respond to a question: why are some university researchers more likely to create spin-off companies than others? Montoro-Sanchez et al.(2006) used two questionnaires that were elaborated, similar in their structure but adapted to the specific features of each kind of partner. The questionnaires were sent during 2002 and the valid return rate was 36.37% for the firm sample and 24% for the RO sample. Similarly, Landry et al.(2006) used questionnaire and Freitas et al.(2013) collected data using semi-structured, face-to-face interviews. On data analysis, Montoro-

Sanchez et al.(2006) used descriptive analysis, Landry et al.(2006) used logistic regression and Freitas et al.(2013) used the regression model. Abramo, D'Angelo, and Di Costa (2011) examined on university-industry research co-operation with emphasis on assess university capabilities; Brunel, d'Este, and Salter (2010) investigated on factors that diminish the barriers to university-industry co-operation; Blumenthal, Causino, Campbell and Louis (1996) studied on relationships between academic institutions and industry in the life sciences using a survey method on representative sample in the United States and Gulbrandsen and Smeby (2005) looked at the industry funding and university professors' research performance. The empirical findings of majority of university-industry relations indicates that institutions with closer connections to industry produce a greater number of spin-offs and show more entrepreneurial activity, such as academics consulting with industry, faculty involvement in new firms, and faculty and university equity participation in start-up firms. Although, Birley (1986) argued that interaction with industry is indispensable in order to: assemble relevant information about the new business, seek external support and services, find external resources, publicize the new company, and to search for business advice. The researcher contend with Montoro-Sanchez et al.(2006) among other researchers that classifies the point of collaborations in different classes; financial, technological, strategic, educational and political. Montoro-Sanchez et al.(2006) opines that the most significant reasons for firms to cooperate are strategic, especially those linked with the improvement of competitive advantage and thus strategic reasons are clearly more important than any other.



### **2.5.5 Opportunity Identification Recognition**

To define, an opportunity is “the chance to meet a market need (or interest or want) through a creative combination of resources to deliver superior value” (Schumpeter, 1934; Kirzner, 1973; Casson, 1982; Ardichvili et al., 2003). Ardichvili et al. (2003) utilized the five phases of Dubin’s theory building framework to propose a theory of the opportunity identification process. In support of the study and other relevant literature on opportunity identification, the process has three steps; opportunity development, opportunity recognition, and opportunity evaluation. Even from Hannibal, Evers and Servais (2016) that examines opportunity recognition process from international new venture creation, the trio acknowledges that though the opportunity development process is cyclical and iterative but portends that self-efficacy of the academic and access to specific resources are important for its success. This argument is in line with the current study that observes that creation of spin-off firms is a function of individual-opportunity-university context. Furthermore, Bhave (1994) uses the process model of entrepreneurial venture creation to study twenty-seven business in a range of industries in upstate New York. Notably, the process is divided into the opportunity stage, the technology set-up and organization-creation stage, and the exchange stage. On the hand, closely related is Alvarez & Barney (2007) that uses two approaches discovery and creation theories for formation of entrepreneurial opportunities that largely boards the environment and individual academics. While Bhave (1994) uses interviews to collect data, Hannibal, Evers and Servais (2016) employs a case study based on a qualitative approach in of two Danish and two Irish university spin-offs. Although the current study is only based on higher learning institutions in Kenya, the researcher supports the cross-country perspective spanning

Denmark and Ireland hence strengthens the study's generalizability in an international setting. Empirical findings from Ardichvili et al. (2003) assets that academics personality traits, social networks, and prior knowledge as antecedents of entrepreneurial alertness to business opportunities. In particular entrepreneurial alertness was singled out as the necessary condition for the success of the opportunity identification triad: recognition, development, and evaluation.

Hannibal, Evers and Servais (2016) suggested that the academics activities and interactions are considered pivotal in driving the opportunity recognition process leading to international new venture emergence. The current study borrows from Alvarez and Barney (2007) and Mansour and Maliqi (2016) assertions and affirms that academic entrepreneurs are constantly scanning the environment for opportunities that come into existence as a result of external changes. While on the other hand, that an opportunity is intrinsically related to the academic entrepreneur who is invariably exploring new ways to produce new products and services that are geared towards meeting a particular market need.

### **2.5.6 University Contextual Elements**

The current study advocates that higher learning institutions in Kenya should shift to “entrepreneurial universities” where they are not just producers of human capital and industry-ready workers but instead pursue academic entrepreneurship that will strategically position them as important engines of sustainable technological development and economic growth, as a source of income and employment and as a contributor to improvement of cultural life (Yıldırım & Aşkun, 2012).

Yıldırım and Aşkun (2012) uses qualitative content analysis to investigate the entrepreneurial intentions of public universities in Turkey's 2011-2012 academic year. The researchers examines the universities strategic postures, cultural and organizational units that supplement and support entrepreneurial activities and collaborations. Smilor et al. (1990) used survey questionnaire on 23 technology-based spin-out companies from the University of Texas at Austin to find out the factors that improve and prevent the formation and development of spin-out companies from the university. Lockett, Wright and Franklin (2003) used comprehensive questionnaire survey of spin-out activity at 57 U.K. universities to investigate the strategies that universities uses to promote the creation of spin-out companies and how they then manage the development of these companies. Despite the fact that they are years apart and from the UK and US, they provide important foundational information that is crucial to the current study on role of the university in spin-off creation and development, reasons for start-up and major difficulties facing spin-out companies. The results from the empirical studies are having somewhat similarities. For instance, Smilor et al. (1990) attributes pull and push factors as elements within and without university environment that either encourage or discourages the creation of spin-off firms. Lockett, Wright and Franklin (2003) observed that successful universities not only did they had a greater expertise and networks, but also they had clearer strategies towards the spinning out of companies. Although, Yıldırım and Aşkun (2012) observed that majority of the public universities in Turkey does not emphasize entrepreneurship in their strategic statements, the duo concurred with Lockett, Wright and Franklin (2003) that entrepreneurial intentions of universities should be exemplified from their strategies, culture, institutional infrastructure,

collaborations/partnerships. Therefore the current study builds on the earlier empirical studies and hypothesizes that; physical, cultural, economic, legal/political, quality of education of the academic entrepreneurs contribute to the creation of spin off firms. The assertions are in line with Fini, Grimaldi, Santoni and Sobrero (2011) study on a sample of 404 companies spin offs from the 64 Italian Science, Technology, Engineering, and Mathematics universities (STEM universities) over the 2000–2007 period. They portended that that University-Level Support Mechanisms (ULSMs) marginal effect on universities' spin-off productivity may be positive or negative depending on the contribution offered by different Local-Context Support Mechanisms (LCSMs). Therefore regional settings' idiosyncrasies should be considered for universities to develop effective spin-off support policies.

## **2.6 Research Gap**

Having reviewed the literature and empirical studies that focus on academic entrepreneurship it became clearer that academic entrepreneurial intentions in creation of university spin-off firms in higher learning institutions in Kenya and larger East Africa are still at the inception compared to developed countries like United States, China, Japan and several European countries being at prime stages. In Africa's context, few studies have been done either Southern African countries like South Africa and Zambia or Western Africa countries like Ghana and Nigeria with insignificant mention to East African countries like Kenya, Uganda, Tanzania, Rwanda and Burundi. However, none of the local empirical studies on both public and private universities has expressly dealt with the concept of creation of university spin-off firms by combining both academic staff and

students at both undergraduate and post-graduate levels and engaging all the process elements such as opportunity, individual and university context found in entrepreneurial process to ultimate outcome – new venture (university spin-off firm). Noticeably, the existing studies examine singular components without explaining the complex interactions between the multiple activities, actors, and key success factors associated with each stage of the academic entrepreneurship process. Furthermore, there is very minimal literature and vague knowledge on how effective local universities and public research institutions are exploiting, transferring and commercializing their research.

### **2.7 Summary of literature reviewed**

This chapter helps to appreciate what other scholars; both local and international have written about academic entrepreneurial intentions and creation of university spin-off firms. Most importantly, it tried and filled in the gaps the other researchers left. Various past research studies and literatures was collected and gathered to complete this chapter.

## **CHAPTER THREE**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter discusses the approaches that were used to carry out the study. The methodology includes research philosophy, research design, target population, sampling design and the sample size. Besides, the chapter dealt with data collection procedures, pilot testing, data analysis techniques and the statistical measurement model.

#### **3.2 Research philosophy and design**

##### **3.2.1 Research philosophy**

The research philosophy that was adopted in this study was pragmatism (Creswell, 2013). This approach allowed the researcher to use appropriate methods, techniques and procedures that appropriately matched to the specific questions and objectives of the research study. This is because every method has its limitations and that the different approaches can be complementary. Pragmatism ensured that the research problem was central, suitable data collection and analysis tools were selected to provide empirical data on academic entrepreneurial intentions and creation of spin-off firms (Creswell, 2013).

##### **3.2.2 Research design**

A research design is the framework or plan for a study used as a guide in collecting and analyzing data. Kothari (2004) describes research design as the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and to control variance. There are three basic types of research design: exploratory, descriptive, and causal. Exploratory research is conducted to provide a better understanding of a situation. Through exploratory research, researchers hope to produce hypotheses about what is going

on in a situation. Descriptive research is usually concerned with describing a population with respect to important variables. Causal research is used to establish cause-and-effect relationships between variables (Cooper & Schindler, 2003).

To investigate the influence of academic entrepreneurial intentions on the creation of university spin-offs in Kenya, a mixed research approach of exploratory, descriptive and causal method of researches were used. In the study, exploratory method provide the researcher with the flexibility to explore different aspects of academic entrepreneurial intentions in relation to creation of university spin-off firms. Descriptive research assisted in investigating specific areas of the study variables that needed response to who, what, when, where, why, and how of the research. Causal research helped to probe the correlation between the study variables. Data was collected and modeled such that the most credible explanations were provided while on the other hand the unreliable explanations were further investigated (Kothari, 2004).

Predominantly, the research study adopted both quantitative and qualitative approaches. Creswell (2013) opine that qualitative and quantitative are the two main approaches that define any research and complement each other; whereas qualitative approach provides in-depth explanations, quantitative approach provides the hard data needed to meet required objectives. Moreover, most studies use quantitative and qualitative approaches to examine relationship between different variables and measure objective theories (Zikmund, Babin, Carr, & Griffin, 2013). Under quantitative approach, the researcher quantified data using statistics to analyze the relationship between dependent variable;

creation of university spin-off firms and the independent variable; entrepreneurial self-efficacy, Personal and Professional Networks, cooperation with industry, moderating variable; opportunity identification and recognition and university context, antecedent; personal motivation. Similarly, qualitative approach was adopted to provide in-depth understanding of the situation about academic entrepreneurial intentions and creation of spin-off firms (Creswell, 2013).

### **3.3 Target Population**

Target population refers to the entire group of individuals or objects to which researcher is interested in generalizing the conclusions. In this study the population was the academic staff and students (both undergraduate and postgraduate) in private and public universities. According to the Commission for University Education indicate that there are 23 accredited public universities, 12 public universities constituent colleges, 17 chartered private universities, 5 private university constituent colleges and 14 private universities with Letters of Interim Authority with more than 500,000 students at undergraduate and post graduate levels (CUE, 2016). On the other hand there are more than 10,000 academic staff both on full time and part time basis teaching in private and public universities in Kenya (MoEST, 2015).

Table 3.1 shows that the target population of this study was all the 152,064 academic staff and students (both undergraduate and postgraduate) drawn from the 5 schools/faculties//departments in 10 major private and public universities using the 2014 July Webometric Ranking of World universities. The academic divisions were; Pure and Applied Sciences, Engineering, Computer Science and Information Technology and Mathematics. The universities were; University of Nairobi (UoN), Kenyatta



University(KU), Jomo Kenyatta University of Agriculture and Technology (JKUAT), Egerton University (Egerton), Moi University(Egerton), Strathmore University, KCA University, Maseno, Mount Kenya University (MKU), United States International University (USIU-K).

According to the 2013/2014 academic year the following were the statistics:

**Table 3. 1 Total target population of academic staff and students in top ten universities**

Name of Universities	Location	Public/Private	Academic Staff	Students	TOTAL
			Pure and Applied Sciences, Mathematics, Engineering, and Technology faculties or departments		
1. University of Nairobi	Nairobi	Public	1,109	38,815	39,924
2. Kenyatta University	Nairobi	Public	679	23,765	24,444
3. Jomo Kenyatta University of Agriculture and Technology (JKUAT)	Nairobi	Public	561	19,635	20,196
4. Egerton University	Njoro	Public	492	17,220	17,712
5. Moi University	Eldoret	Public	536	18,760	19,296
6. Strathmore University	Nairobi	Private	113	3,955	4,068
7. KCA University	Nairobi	Private	81	2,835	2,916
8. Maseno University	Kisumu	Public	327	11,445	11,772
9. Mount Kenya University	Thika	Private	237	8,295	8,532
10. United States International University (USIU-K)	Nairobi	Private	89	3,115	3,204
<b>TOTAL</b>			4,224	147,840	152,064

Ratio: For every 1 academic staff there are 35 students

### **3.4 Sampling Frame**

A sampling frame comprises of the actual lists of individuals included in the population for the purpose of collecting representative sample data from the larger population and using the sample to infer attributes of the population (Cooper & Schindler, 2003). The sampling frame in the study included official lists of academic staff and students (both undergraduate and postgraduate) from the 5 schools/faculties/departments from the 10 major public and private universities in Kenya.

The data on the academics staff was collected using from their latest Curriculum Vitae (CVs) from their respective Human Resource Units in their respective universities. While for students it was extracted from the enrollment rate register for academic year 2013/2014 available at the registrar academics and dean of students' offices of the respective universities.

### **3.5 Sample and Sampling Technique**

A sample is a subsection of people, items, or events from a bigger population that you collect and analyse to make inferences. To represent the population well, a sample should be randomly collected and adequately large (Saunders, 2011). According to Kothari (2004), sampling refers to the selection of a few items that are as representative as possible to produce a miniature cross- section of all items constituting a population in a field of inquiry. There two main types of sampling; probability and non-probability. In probability sampling every member of population has a known chance of participating in the study. Probability sampling methods include simple, stratified systematic, multistage, and cluster

sampling methods (Blumberg, Cooper, & Schindler, 2014). On the other hand, non-probability sampling, sampling group members are selected on non-random manner, therefore not each population member has a chance to participate in the study. Non-probability sampling methods include purposive, quota, convenience and snowball sampling methods (Blumberg et al., 2014).

Initially, the researcher employed stratified sampling technique to divide the respondents into academic staff and students. Later on dividing the students were divided into undergraduate and postgraduate strata. Stratified random sampling was found to be appropriate as it enables the researcher to represent not only the overall population but also key sub-groups of the population. Thereafter, the researcher used simple random sampling technique to determine the sample size. This process ensured that there was equal representation of all individuals in the defined population to be selected as a member of the sample (Saunders, 2011).

The appropriate sample size for a population-based survey is determined by three factors: The estimated prevalence of the variable of interest-academic entrepreneurial intentions in this instance; the desired level of confidence, and; the acceptable level of margin of error (Mugenda & Mugenda, 2008). For a survey design based on a simple random sample, the sample size required can be calculated according to the following formula:

*Formula:*

$$n = \frac{z^2 \times p(1-p)}{m^2}$$

*Description:*

**n** = required sample size

**z** = the standard normal deviate at the required 95 % confidence level (standard value of 1.96)

**p** = estimated prevalence of academic entrepreneurial intentions in the research is about 30%.

**m** = margin of error at 5% (standard value of 0.05).

Table 3.2 shows the official list of 152,064 academics of the top ten universities in Kenya that formed the sampling frame from which the sample was drawn.

Calculation:

Sample size

$$n = \frac{z^2 \times p(1-p)}{m^2}$$

$$n = \frac{1.96^2 \times 0.3(1-0.3)}{0.05^2} = 322.72$$

$$= 323$$

**Table 3. 2 Determination of sample size**

Name of University	Total Population	Calculation	Sample Size
a) University of Nairobi(UoN)	39,924	323*39,924/152,064	84
b) Kenyatta University (KU)	24,444	323*24,444/152,064	52
c) Jomo Kenyatta University of Agriculture and Technology (JKUAT)	20,196	323*20,196/152,064	43
d) Egerton University	17,712	323*17,712/152,064	38
e) Moi University	19,296	323*19,296/152,064	41
f) Strathmore University	4,068	323*4,068/152,064	9
g) KCA University	2,916	323*2,916/152,064	6
h) Maseno University	11,772	323*11,772/152,064	25
i) Mount Kenya University	8,532	323*8,532/152,064	18
j) United States International University (USIU-K)	3,204	323*3204/152,064	7
<b>Sample</b>	<b>152,064</b>		<b>323</b>

### **3.6 Data collection instrument and measurement development**

#### **3.6.1 Data collection instrument**

The main data collection instrument used in the study was a self-administered questionnaire. Saunders (2011) observes that questionnaires are effective data collection instruments in the sense that they allow respondents to give information on their current and previous behaviour, attitudes and perceptions. Both structured and unstructured questionnaires were used. The structured questionnaires gathered quantitative data while at the time unstructured questionnaires were used to describe the responses of the respondents (Kothari, 2004).

The questionnaire's main sections revolved around the main variables (dependent, independent and moderating variables). In addition, the questions covered general information about the respondents and academic entrepreneurial intentions. The responses in the questionnaire were assigned numerals that is 1 to 5 on the Five Part Likert Scale to collect interval data. This was important because it facilitated efficient analysis and also it consolidates all the responses into defined critical information only (Kothari, 2004). The data collected was coded and summarized for final processing. It is important to note that before conducting the research, the researcher obtained an approval to conduct the study and a letter of introduction from the relevant department at the University.

#### **3.6.2 Measurement development**

Questionnaires remain the most commonly used data collection tool in social sciences research. Therefore, its logical development is central in obtaining appropriate statistics while at the same time reducing measurement errors. The study used five sequential steps

process adapted from Radhakrishna (2007); research background development, questionnaire conceptualization, formatting the questionnaire, examining validity and finally pilot testing to establish reliability in readiness for data collection, analysis and reporting (Radhakrishna, 2007).

Research background development was the preliminary step that was taken, the purpose, objectives, research questions, and hypothesis of the proposed research are examined. The researcher, established who the audience was, what was their background was there with regard to their educational levels. In addition, access and the process used to select the respondents (sample versus population) was clearly determined. Most importantly to note is that a thorough understanding of the research problem through literature exploration and analyses is a must (Cooper & Schindler, 2003). Thus good preparation and understanding of Step 1 provides the base for commencing Step 2.

Secondly, after an in-depth understanding of the research, the next step was to generate statements/questions for the questionnaire. This is where the actual content from literature/theoretical framework was converted into statements/questions. Furthermore, a relationship between the objectives of the study and their conversion into content is established. Major variables (independent, dependent, and moderator and antecedent variables) were identified and well defined. Thirdly, the statements/questions were formatted, appropriate scales of measurement were also selected and a definite questionnaire layout designed. In the study, a 5-point likert scale was used to quantify a subject's response on a particular variable. Proper understanding of the relationship between the level of

measurement and the appropriateness of data analysis was greatly considered (Cooper & Schindler, 2003).

Fourthly, a draft questionnaire was completely ready for establishing validity that is the amount of systematic or built-in error in measurement. In the study, the validity was established on one hand by using a panel of experts drawn from the department and my research supervisors while on the other hand conducted field tests and in the process gathered data from several academic in selected universities. While conducting the exercise, several questions emerged and were clearly addressed at the end an all-inclusive instrument was developed, the questions were; “is the questionnaire valid?” In other words, is the questionnaire measuring what it intended to measure? , “Does it represent the content?”, “is it appropriate for the sample/population?”, “Is the questionnaire comprehensive enough to collect all the information needed to address the purpose and goals of the study?”, “Does the instrument look like a questionnaire?”

Finally, a pilot test was conducted to establish the reliability of the questionnaire that is the random error in measurement. The pilot test seeks to answer the question, does the questionnaire consistently measure whatever it measures? Reliability indicates the accuracy or precision of the measuring instrument (Kothari, 2004). In this regard, the researcher collected pilot data from 32 academics from Jomo Kenyata University of Agriculture and Technology (JKUAT), one of the public universities located in the outskirts of Nairobi. Data collected from the pilot test was analyzed using SPSS version 23 in a "correlation matrix" and "view alpha if item deleted" column was included to

identify which questions were not having consistent measurements. Therefore, the items that were perceived that they would substantially improve reliability were deleted from the questionnaire or modified using expert guidance. The reliability coefficient (alpha) that range from 0 to 1, with 0 representing an instrument with full of error and 1 representing total absence of error was generated. Questions that had a reliability coefficient (alpha) of 0.70 and above were retained for such questions were considered to be having acceptable reliability (Corbin & Strauss, 2008).

### **3.7 Data collection procedure**

Insomuch as the research engaged a combination of exploratory, descriptive and causal method of research designs, it should be noted that quantitative and qualitative approaches were predominantly used. To obtain quantitative data; structured questionnaires were used with predetermined response categories on a 5-point likert scale. The collected results were deemed to be easy to summarize, compare, and generalize providing the valuable information for testing hypothesis and research model. To obtain qualitative data; unstructured questionnaires were employed in order to find out the general patterns among different respondents in the sample study and in furtherance support quantitative findings.

#### **3.7.1 Operationalization of Study Variables**

Each study variable was operationalized according to parameters established from empirical studies relevant to the research. Therefore, the specific items in the questionnaire were developed in line with the research variable and the variable parameters as shown in Table 3.3 below.



**Table 3. 3 Research study variables and variable parameters.**

The research study variable	Variable parameters
General characteristics of variables (Demographic data)	Academic characteristics: 1. Gender 2. Age 3. Qualifications 4. Specialization
Creation of University Spin-off (CUSOF/TTP) firms	1. Generate phase-originate a viable business idea (conception and development) 2. Finalize phase- scan, evaluate and translate the idea into a business process (Commercialize) 3. Launch phase-Create a firm (Growth) and 4. Strengthen phase-Contribute value to customers, employees, investors and all other stakeholders (Stability).
Entrepreneurial Efficacy(ESE)	Self 1. Develop new product or market opportunities (skills related with opportunity recognition), 2. Build an innovative environment (skills related with the capacity to encourage others) 3. Initiate investor relationships (skills related with obtaining funds to capitalize the start-up company), 4. Define core purpose (mission and vision creation and communication skills to attract key staff and investors), 5. Cope with unexpected challenges (skills to cope with risky and uncertain situations), 6. Develop critical human resources (skills to employ and develop human resources). <i>Adapted from De Noble, Jung, &amp; Ehrlich (1999)-Six major dimensions of ESE.</i>
Personal and Professional Networks(PPN)	1. Personal/Private/Informal collaborations (immediate personal environment consisting of family members and close friends) 2. Professional/ Formal collaborations (commercial exploitation of technology or knowledge through patenting, spin-off and licensing); 3. Research-related/Non-formal collaborations a. Joint research b. Contract research c. Consulting d. Learning (gaining new insights, receiving feedback on research, and accessing new knowledge through engagement with industry) e. Access to funding (complementing public research monies with funding from industry); and f. Access to in-kind resources (using industry-provided equipment, materials and data for research).
Co-operation Industry(CWI)	With 1. <b>Financial</b> • Additional financial sources • State grants 2. <b>Technological</b> • Access to teams and materials • Access to experience of employees 3. <b>Strategic</b> • Access to strategic resources

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	<ul style="list-style-type: none"> <li>• Improving image/prestige/reputation</li> <li>• Citations, publications</li> <li>• Doctoral dissertations, conferences</li> </ul>
	<ol style="list-style-type: none"> <li>4. <b>Educational</b> <ul style="list-style-type: none"> <li>• Training in the firm</li> <li>• Mobility of firm staff</li> </ul> </li> <li>5. <b>Political</b> <ul style="list-style-type: none"> <li>• Adaptation</li> </ul> </li> </ol>
Opportunity Identification and Recognition (OIR)	<ol style="list-style-type: none"> <li>1. Get idea /scan the environment</li> <li>2. Identify the opportunity</li> <li>3. Develop the opportunity</li> <li>4. Evaluate the opportunity and</li> <li>5. Evaluate the team</li> </ol>
University Contextual Elements (UCE)	<ol style="list-style-type: none"> <li>1. <b>Physical environment:</b> Availability of land or other infrastructural facilitates, technological transfer offices/science parks/ business incubators.</li> <li>2. <b>Cultural environment:</b> Attitude of area population, entrepreneurial culture</li> <li>3. <b>Economic environment:</b> availability of venture capital, availability of suppliers, availability of support services, accessibility to customers and new markets</li> <li>4. <b>Legal/political environment:</b> appropriate technological transfer policies/procedures national and county government influence</li> <li>5. <b>Quality of education:</b> Presence of qualified and experienced academic entrepreneurs, (staff and students), technically skilled work force.</li> </ol>

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### 3.8 Pilot Study

A pilot study can be used as a “small scale version or trial run in preparation for a major study” (Blumberg et al., 2014). A sample size of 10–20% of the sample size for the actual study is a reasonable number of participants to consider enrolling in a pilot. Although a pilot study does not guarantee success in the main study, it greatly increases the likelihood (Cooper & Schindler, 2003). Therefore, sample questionnaires were administered to 32 academic staff and students of Jomo Kenyatta University of Agriculture and Technology (JKUAT) randomly selected.

Simon (2011) posits that a pilot study may address a number of logistical issues. As part of the research approach the following issues were resolved prior to the main study as

pointed out by Simon (2011):(1) Checked that instructions are comprehensible (2) Checked that research assistants and data technicians are sufficiently skilled in the procedures (3) Checked the wording of a research instrument (4) Checked the reliability and validity of results (5) Checked the statistical and analytical processes to determine if they are efficacious.

### **3.8.1 Validity**

Validity is defined as the extent to which the instrument measures what it purports to measure: it is the correctness, or credibility of a description, conclusion, explanation, interpretation or other sort of account (Kumar & Phrommathed, 2005). According Kumar and Phrommathed (2005) there are two approaches to establishing the validity of an instrument; logic and statistical evidence. In the study, validity was achieved by measuring the logical link between questions and the objectives. First, the wording of the questions was kept in line with the approach of Zikmund et al (2013) of the manner to enhance the validity of the research. There are three types of validity namely; Face, Content and Construct. Face is a subjective means of determining whether the instrument is measuring what it was developed to measure; Content is the representativeness of the items on an instrument as related to the entire study population; Construct is the ability of indicators and scales to measure accurately the variables under study (Cooper & Schindler, 2003). Secondly, the research ensured that there is plenty of data (through in-depth interviews); obtaining respondents' validations (protocol for data collection) and searching for discrepant evidence (protocol for data analysis). In further efforts to overcome the challenge of validity, the questionnaire utilized some exiting constructs and adaptation of existing questions (Hair, Anderson, Babin, & Black, 2010).

### **3.8.2 Reliability**

Kothari (2004) defines reliability as the extent to which a questionnaire, test, observation or any measurement procedure produces the same results on repeated trials. The internal reliability test it is denoted by Cronbach's Alpha reliability coefficient  $\alpha$ , and ranges was between 0 and 1, where the closer  $\alpha$  is to 1.0 the greater the internal consistency of the items in the scale. With regard to testing of internal reliability of the study variables the following were the score; Entrepreneurial Self Efficacy, 0.842; Personal and Professional Networks, 0.734; Co-operation With Industry, 0.852; Personal Motivation, 0.534; Opportunity Identification and Recognition, 0.789; University Contextual Elements, 0.833; Creation of University Spinoff Firms, 0.796; Academic Entrepreneurial Intentions, 0.851. This indicates that the internal reliability of the instrument was reasonable as a Cronbach's alpha of 0.50 as a minimum level was said to be acceptable (Zikmund et al., 2013).

## **3.9 Data Processing and analysis and research model**

### **3.9.1 Data processing and analysis**

The research data collected from the respondents was both qualitative and quantitative in nature. The qualitative data was analyzed using content analysis that essentially enabled the researcher to make replicable and valid inferences by interpreting and coding textual materials which later on was converted into quantitative data. Since the responses were coded into categories and themes, they were measured on a numerical scale to determine the strength of various responses (Kumar & Phrommathed, 2005). Besides, quantitative data was analyzed using descriptive and inferential statistics. Zikmund et al.(2013) portends that descriptive statistics collects, organizes, analyzes and presents data in a meaningful way, on the contrary,

inferential statistics compares data, test hypothesis and make predictions of the future outcomes. Similarly, Creswell (2013) observes that descriptive statistics is concerned with describing the population under study while on the other hand inferential statistics focuses on drawing conclusions about the population, on the basis of sample analysis and observation.

For that reason, data analysis has three basic objectives; getting a feel of the data, testing the goodness of the data and testing hypothesis developed for the research (Kothari, 2004; Mugenda & Mugenda, 2008). In conclusion, the data from the questionnaires that were duly completed were organized, coded, analyzed and interpreted on the basis of the research questions using descriptive statistics and inferential statistics with Statistical Package for Social Sciences (SPSS) version 20 and Microsoft Excel 2013 (Ms Excel 2013). Remarkably, SPSS is adequate in analyzing coded data using statistical models and tests of significance but Ms Excel 2013 is capable of summarizing data and frequencies.

In this research study, nominal and interval scales were used as the level of measurement in collecting the biographical data and independent variables measurements. In descriptive statistics there is use of diagrammatic or tabular representation of final results that is percentages, frequency distributions, means, and standard deviation while on the hand in inferential statistics final results are displayed in form of probability of properties of the population on the basis of the properties of the sample. Major inferential statistics are based on the statistical models such as Analysis of Variance (ANOVA), chi-square test, student's t-distribution, regression analysis, etc. (Blumberg et al., 2014; Cooper & Schindler, 2003; Creswell, 2013; Kothari, 2004; Mugenda & Mugenda, 2008; Saunders, 2011).

### **3.9.2 Research models**

The research used a multiple correlation and coefficient of determination, and multiple linear regression for the research model.

#### **a) Multiple Correlation and Coefficient of Determination**

Multiple correlation (R) is a measure of the correlation between the observed value and the predicted value of the criterion variable. While, the coefficient of determination, R Square ( $R^2$ ) indicates the proportion of the variance in the criterion variable which is accounted for by the model. In essence, this is a measure of how well a prediction of the criterion variable can be made by knowing the predictor variables.

#### **b) Multiple Linear Regression**

Multiple linear regression is a statistical technique that allows the researcher to predict the score on one variable on the basis of scores on several other variables. Many researchers use the term “independent variables” to identify those variables they think will influence some other so-called “dependent variable”. Independent variables are known as predictor variables and dependent variables as criterion variables. If two variables are correlated, then knowing the score on one variable enables the researcher to predict the score on the other. The stronger the correlation, the closer the scores will fall to the regression line and therefore the more accurate the prediction will be. Multiple Linear Regression is simply an extension of this principle, where a specified variable is predicted on the basis of several others. In multiple regression the researcher does not directly manipulate the independent variables but instead, simply measures the naturally occurring levels of the variables to see if this helps to predict the score on the dependent variable (Creswell, 2013).

In the study, the data was subjected to both linear and multiple regression analysis. H<sub>1</sub>, H<sub>2</sub> and H<sub>3</sub> used simple linear regression where as H<sub>4</sub> and H<sub>5</sub> employed multiple linear regression analysis. Furthermore, moderated multiple linear regression was used to determine the effect of the each two moderators on each of the independent variable in influencing the dependent variable. The influence of each variable was determined by the size and direction (sign) of the standardized regression for the significant terms.

Thus;

**a) Simple regression model**

The study adopted simple regression models for objective 1, 2 and 3 and then a multiple regression model to test combined objectives 1, 2 and 3. The moderated regression model was used in objective 4 and 5.

**Objective one:**  $Y = \beta_0 + \beta_1 X_1 + \varepsilon$  .....(1.1)

- Where**
- $Y$  - CUSOF/TTP
  - $\beta_0$  - Constant
  - $\beta_1$  - Co-efficient 1
  - $X_1$  - ESE
  - $\varepsilon$  - Error term

**Objective two:**  $Y = \beta_0 + \beta_2 X_2 + \varepsilon$  .....(1.2)

- Where**
- $Y$  - CUSOF/TTP
  - $\beta_0$  - Constant

$\beta_2$  - Coefficient 2

$X_2$  - PPN

$\varepsilon$  - Error term

**Objective three:**  $Y = \beta_0 + \beta_3 X_3 + \varepsilon$  .....(1.3)

**Where**  $Y$  - CUSOF/TTP

$\beta_0$  - Constant

$\beta_3$  - Coefficient 3

$X_3$  - CWI

$\varepsilon$  - Error term

**b) Multiple regression model**

**Combined objective one, two and three:**  $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$  .....(1.4)

**Where**  $Y$  - CUSOF/TTP

$\beta_0$  - Constant

$\beta_1$  - Co-efficient 1,

$\beta_2$  - Coefficient 2,

$\beta_3$  - Coefficient 3

$X_1$  - ESE

$X_2$  - PPN



$X_3$  - CWI

$\varepsilon$  - Error term

**c) Moderated multiple regression model**

Model 1.5 was used to ascertain the extent of the regression effects of each of the two moderating variables on each of the three independent variables and furthermore the combined regression effect of the dependent variable. Finally Model 1.6 was employed to test the joint moderating effect; combined moderators on combined independent variables on the dependent variable.

**Objective four and five:**

$$Y = \beta_0 + \beta_i X_i + \beta_z Z + \varepsilon \dots\dots\dots 1.5$$

Further written us  $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$

$$Y = \beta_0 + \beta_i X_i + \beta_z Z + \beta_{iz} X_i Z + \varepsilon \dots\dots\dots 1.6$$

Further written us

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_z Z + \beta_{z1} X_1 Z + \beta_{z2} X_2 Z + \beta_{z3} X_3 Z + \varepsilon$$

**Where**  $Y$  - CUSOF/TTP

$\beta_0$  - Constant

$\beta_1$  - Co-efficient 1,

$\beta_2$  - Coefficient 2,

$\beta_3$  - Coefficient 3

$X_1$  - ESE

$X_2$  - PPN

$X_3$  - CWI

Z- Either OIR or UCE (predictors),

$i$  - ESE, PPN, CWI

$\varepsilon$  - Error term

#### **d) Statistical Significance Tests**

First and foremost, the F statistic was used to determine the validity of the model. The null hypothesis was rejected based on the significance in the regression mode. If the null hypothesis  $H_0: \beta_z=0$  (t-test) was rejected, then  $X_i$  was taken to have significant influence on Y. The interaction term was considered to be significant if the null hypothesis  $H_0: \beta_{iz}=0$

## **CHAPTER FOUR**

### **RESEARCH FINDINGS AND DISCUSSIONS**

#### **4.1 Introduction**

The primary emphasis of this study was to examine the academic entrepreneurial intentions and the creation of spin-off firms in Kenya. Therefore, this chapter presents the results that were involved in the formulation and application of regression models and discussed the key research findings and finally a chapter summary.

#### **4.2 Response rate**

Although the research sample consisted of 323 academics (academic staff, undergraduate and postgraduate students), the researcher distributed 400 questionnaires out of which 387 were returned translating to an overall response rate of 96.8 %. Based on the Khamisa, Peltzer, Ilic, and Oldenburg (2014) who reported a response rate of 81% the number of the questionnaires were adjusted upwards in order to meet the minimum sample size required,  $n=323$  (see Appendix 3). Kothari (2004) observed that a response rate of 50% is considered average, 60-70% is considered adequate while anything above 70% is considered to be excellent response rate. The response rate was therefore considered excellent for the study.

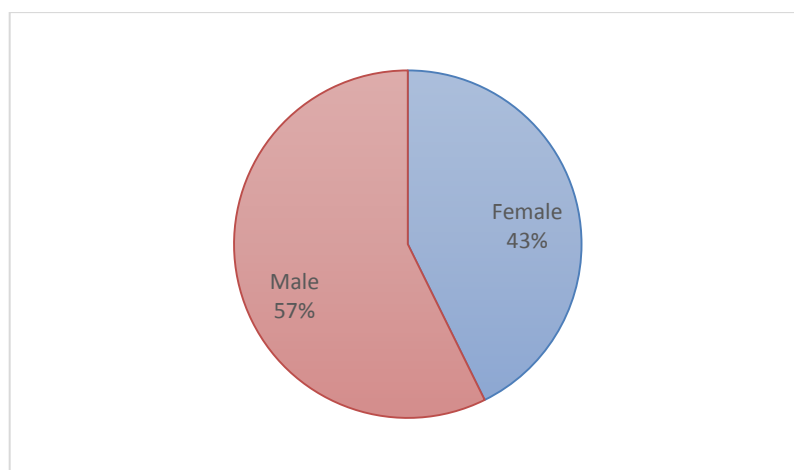
#### **4.3 Description of respondents**

This section presents a description of the respondents in terms of demographics: gender, age, academic qualification and areas of specialization.

##### **4.3.1 Gender of respondents**

The survey results in Figure 4.1 show that majority of the respondents were either teaching or learning at various public and private universities with male compared to female being

57 % and 43 % respectively. This outcome clearly indicates that female are gradually outpacing male in higher education participation. The researcher made deliberate effort to ensure that all the major Kenyan private and public universities and colleges were represented, and about 40% of the sample was female and 60 % was male, a ratio that is roughly the same as that found in the enrolment and graduation distribution of gender in colleges and universities.

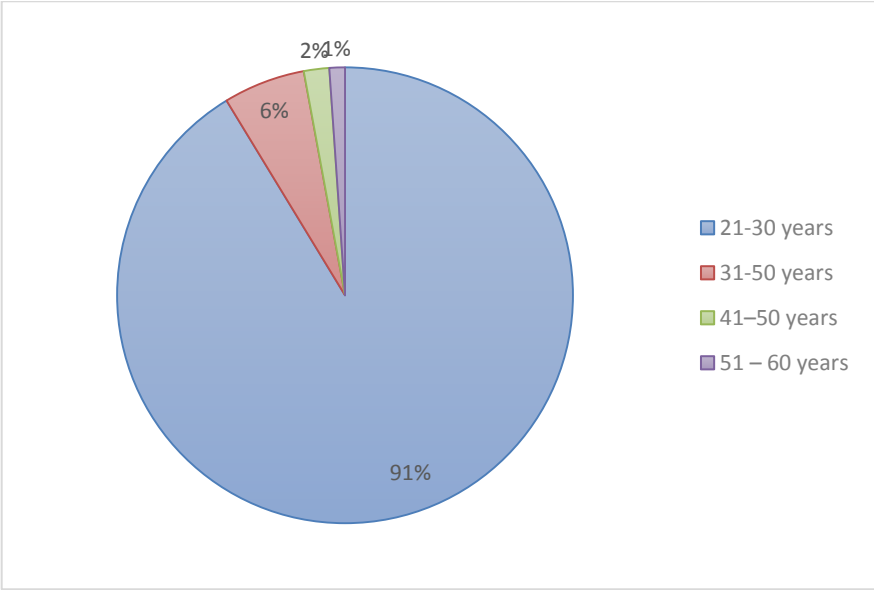


**Figure 4. 1 Gender of respondents**

#### **4.3.2 Age of respondents**

Figure 4.2 shows that majority of the respondents were between the age 21-30 years (91 %). The age bracket observed in the study was in line with other earlier studies that focused on academic entrepreneurial intentions (Autio, Keeley, Klofsten, Gc Parker, & Hay, 2001; Prodan & Drnovsek, 2010). Wang, Lu, and Millington (2011) carried out a study on college students in China and US and their sample was composed of college students, majority of whom were in their second or third years of undergraduate study with an average age of 21.9 years. Similarly, Pihie and Bagheri (2013) investigated a total sample of 722 Malaysian students from public (n=331, 45.8 %) and private (n=391, 54.2 %) universities were randomly selected to participate in this study. Majority of the students

were aged between 16 and 25 (76.9 %) years (4.8 % of the students were between 26 and 30 years old, 6.6 % were between 31 and 40 years old, and 7.6 % were between 41 and 50 years old). The sample consisted of 377(52.2 %) males and 342 (47.4 %) females. Most of the students were pursuing their Bachelor degrees (n=541, 74.9 %). The students had different educational backgrounds: agricultural science (n=104, 14.4%), information technology (n=82, 11.4 %), accounting and finance (n=41, 5.7 %), and others (n=495, 68.5 %). Majority of the participants had no business experiences (n=491, 68 %) and had never taken an entrepreneurship course (n=363, 50.3 %)

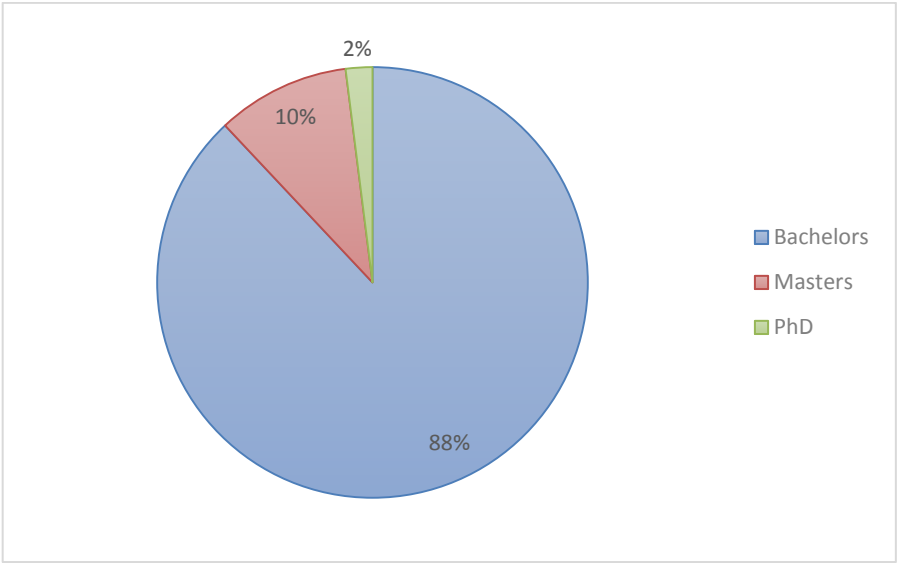


**Figure 4. 2 Age of respondents**

**4.3.3 Academic qualifications**

The respondents were asked to indicate their academic qualifications. The results from the study showed that 88 percent (333 respondents) were pursuing their undergraduate studies in various programmes at both public and private universities, 10 percent (38 respondents) were undertaking their masters’ degrees with 2 percent (7 respondents) doing their doctoral studies as shown in Figure 4.3. These finding were consistent with past studies.

D'Orazio, Monaco and Palumbo (2012) examined 729 PhD students who were employed in sciences department and research area of University d'Annunzio in Italy. The study reported 12 percent response rate with 85 respondents. The research concluded that the PhD students are potential academic entrepreneurs since they have a critical role in the identification of the best way to commercialize the results of their research to improve the technology transfer process. Wang, Lu, and Millington (2011) examined 600 college students from seven universities, three in China and four in the US. The three universities in China were: University of Science and Technology of China (USTC), Hefei University of Technology (HFUT), Southwest University of Science and Technology (SWUST). The four universities in US are: Utah Valley University (UVU), Brigham Young University Hawaii (BYUH), Brigham Young University (BYU) and George Mason University (GMU). The response rate was 67.5 percent with 393 questionnaires being returned. The distributions was as follows; Bachelors, 336 (China, 265; US, 71), Masters, 51 (China, 15; US, 36), MBA, 3 (China, 1; US, 2), Doctorate, (China, 1; US, 2).



**Figure 4. 3 Academic qualifications of respondents**

#### **4.3.4 Area of specialization of respondents**

Table 4.1 indicates that 31.9 % of the respondents were drawn from Information Technology/ Computer Science, 16.5 % of respondents from Medicine, 13.9 % of the respondents from Engineering and 11.5 % of the respondents from Pure and Applied Sciences. In addition, other disciplines like Agriculture, Mathematics, Architecture, Biotechnology and Pharmacy, had less than 10 % that is 9.7%, 5.0%, 4.4%, 3.8%, 3.2% respectively. These findings were in line with other similar past studies. For instance, Autio et al. (2001) examined a combined sample of 3,445 university students mostly from science and technology based disciplines from three universities that is Helsinki University of Technology in Finland, Linköping University in Sweden, the University of Colorado in USA, and Stanford University in the USA. The researchers also observed that the ages of the respondents varied slightly with the Swedish sample being considerably young with a median age of 22 years while Colorado being the oldest with a mean age of 29 years. The older respondents were reported to being graduate students rather than undergraduate, had more work experience and most likely were married with children. Similarly, Chrisman et al. (1995) observed that the faculties of Engineering, Medicine, and Sciences were the most productive in technology transfer at University of Calgary, although significant activity took place at other faculties as well. According to Shane (2004), the fields of biotechnology and computer software, are most common for university spin-off creation.

**Table 4. 1 Areas of specialization**

	<b>Frequency</b>	<b>Percent</b>
Information Technology/Computer Science	108	31.9
Medicine	56	16.5
Engineering	47	13.9
Pure and Applied Sciences	39	11.5
Agriculture	33	9.7
Mathematics	17	5.0
Architecture	15	4.4
Biotechnology	13	3.8
Pharmacy	11	3.2

#### **4.3.5 Other areas of Specialization of the respondents**

In the study, Table 4.2 shows that majority of the other the respondents in the research had a percentage that was less than 10% with those pursuing Bachelor of Education (Science) having 4.4 % making it top on the list. Bachelors of Public Health and Nursing each had 1.2 % while on the other hand respondents pursing undergraduate courses in Chemistry, Biochemistry, Control and Instrumentation, Food science and Nutrition, Laboratory medicine, Leather Science and Technology each had 0.6% but the rest of the remaining fields had 0.3%. Just as it was clearly noted in Figure 4.3 above, nearly 92 % of the respondents in other areas of specialization were pursuing undergraduate courses as compared to the remaining 8% that were doing their postgraduate qualifications (Masters and Doctors of Philosophy).



**Table 4. 2 Other areas of specialization of respondents**

<b>Area of Specialization</b>	<b>Frequency</b>	<b>Percent</b>
Bed. Science	17	4.4
Bsc. Agricultural extension and food security	1	0.3
Bsc. Agriculture economics	1	0.3
Bsc. Animal health management	1	0.3
Bsc. Applied computer technology	1	0.3
Bsc. Biochemistry	2	0.6
Bsc. Chemistry	2	0.6
Bsc. Control and instrumentation	2	0.6
Bsc. Food science and nutrition	2	0.6
Bsc. Health records and information	2	0.5
Bsc. Lab medicine	2	0.6
Bsc. Leather science and technology	2	0.6
Bsc. Mechanical Engineering	1	0.3
Bsc. Nursing	4	1.2
Bsc. Physics	1	0.3
Bsc. Public health	4	1.2
Bsc. Statistics	1	0.3
Bsc. Telecommunication and information	1	0.3
Bsc. Wildlife management	1	0.3
Bsc. Veterinary medicine	2	0.6
Msc. Biochemistry	1	0.3
Msc. Biochemistry	3	0.9
PhD.	2	0.6

#### **4.4 Statistical Analysis of study variables**

In order to examine academic entrepreneurial intentions and the creation of university spin-off firms in Kenya, the research was arranged around the six variables. This section provides a systematic descriptive, correlational and inferential analysis of each of the variables. The dependent variable was creation of university spin-off firms, independent variables were; entrepreneurial self-efficacy, co-operation with industry. The moderating variables were; opportunity identification and recognition and university contextual elements.

#### **4.4.1 Creation of University Spin-Off Firms/ Technology Transfer Process.**

*General objective: To examine the influence of academic entrepreneurial intentions on the creation of university spin-offs firms in Kenya.*

Creation of spin-off university spin-off firms was measured using constructs developed from a 4- stage process but placed on a 5-Point Likert scale, where 1 represented ‘Strongly Disagree (SD)’ and 5 represented ‘Strongly Agree (SA)’. The phases are: 1) Generate phase-generating a viable business idea (conception and development); (2) Finalize phase-translating the idea into a business process (Commercialize); (3) Launch phase-creating a firm (Growth) and (4) Strengthen phase-contributing value to customers, employees, investors, and all other stakeholders (Stability). In the study, a mean score of <3.00 indicated that a particular sub-process within the creation of university spin-off was being implemented to a less extent, a mean of between 3.00-3.99 was considered to be moderate while that of >4.00 indicated that a process has been performed to a large extent. On the other hand, a standard deviation, > 1 indicated a huge scatter of data from the mean whereas a, <1 indicated a minimal spread from the mean.

##### **4.4.1.1 Descriptive Analysis for Creation of University Spin-Off Firms/ Technology**

###### **Transfer Process (CUSOF/TTP)**

The findings from table 4.3 shows that 72.4 % (M=3.67, SD=1.013) of the respondents agreed that “Publish or Perish” drive among academia enhances idea generation in the universities. This findings are in contrast with the past findings that indicated that emphasis on publishing has reduced the value scholarship with majority of the academic

staff spending a lot of time scrambling to publish whatever they can manage, rather than spend time developing significant research agenda (Rawat & Meena, 2014).

On idea assessment to establish their economic potential, 56.5 % (M=3.36, SD=1.189) agreed that a thorough analysis of their technological, commercial and personal aspects should be carried out, in order to shed light not only on their economic potential, but also on the most suitable way to exploit them commercially (Ndonzuau et al., 2002). Fifty two point six percent (M=3.31, SD=1.151) of the respondents noted that the university always identifies and recognizes the owners of research results from which the idea originated from. Furthermore, the research centers and technological transfer offices should keep their doors open to allow easy detection of new innovations. 53.8% of the respondents posited that no attempts has been done to protect their results from counterfeiting, copying, and imitations. (M=3.33, SD=1.194). This process should be done on one hand, recognizing that the owners of the results on which the ideas is based on while on the other selecting the best method of protection; natural or artificial. The study sought to find out whether the production of a prototype was being done for the economic idea after being protected, 44.5% (M=3.16, SD=1.053) agreed that technical development was conducted to establish both material and immaterial issues. In addition to that, 63% of the respondents (M=3.53, SD=1.151) asserted no business plan has been done to enhance the exploitation of the opportunity.

Notwithstanding the fact that Ndonzuau et al. (2002) indicated that most universities are gradually providing access to physical facilities which are ideally very expensive to

acquire, 54.2 % (M=2.69, SD=1.179) observed that access to material resources for prototyping and starting a spin-off was somewhat difficult . In the study, 63% of the respondents suggested that both institutional (universities and spin-offs) and personal (universities and researchers) relationships were cordial (M=3.60, SD=0.993). This could be attributed to availability of code of best practices in some of institutions to provide a clear guidelines of engagement and especially during period of conflict of interest. This finding support Ndonzuau et al. (2002 who indicated that that the more a researcher is embedded and deeply attached to his/her university, the more challenging it will be for him/her to leave the institution to start a new venture project.

Ordinarily, new ventures will be attracted to move to high-growth markets at national and international arena that has excellent infrastructure, adjacent to skilled people, easy access to funding of their development but in the study, 53.9% (M=3.37, SD=1.032) of the responds pointed out that the universities and local community should encourage them to remain in the neighborhood. In addition, 51.5 % (M=3.32, SD=1.151) of the respondents indicated that the management ensures full exploitation of industrial potential of the technological projects. The research findings observed that 37.6 % (M=2.91, SD=1.306) of the respondents indicated that researches and technologies are completely not based on customer needs. 46.7 % (M=3.09, SD=1.250) of the respondents posited that there is lack of solid rules and regulations for protecting Intellectual Property (IP) rights. In addition, 41.7% (M=3.00, SD=1.187) of the respondents reckoned that there is lack of seed-financing and human resources.

Moreover, the study showed that 44.7% (M=3.07, SD=1.158) of the university managers are unclear about priorities and goals regarding technology transfer. 43.6% (M=2.99, SD=1.277) of the respondents argued that informational and cultural barriers exist between university and industry hence lack of trust and respect. Furthermore, the investigation revealed that 76.1% (M=3.90, SD=0.884) of the respondents opined that there is need to institutionalize a documentation and evaluation systems at the university in order to better protect Intellectual Property rights. 84.8% (M=4.04, SD=0.885).of the respondents suggested that the government should develop an appropriate regulatory structure and revise the existing rules and regulations. In addition, the study showed that 86.9% (M=4.14, SD=0.875) of the respondents proposed that financing of researches and innovations should be carried out from both governmental and non-governmental budgets and funds. 84.1% (M=4.18, SD=1.035) of the respondents recommended that the government should offer tax exemptions in order to motivate investors. Besides, 91.4 % (M=4.30, SD=0.813) of the respondents commended that the university should develop sales and marketing unit to assist in commercialization.

In summary, after achieving a Cronbach threshold of 0.796 (see Appendix 2), the 20 items in Table 4.3 describing the process of creation of spin-off firms (CUSOF/TTP) were aggregated to get Y score for each respondent that is  $\bar{x}=3.4468$ . With the means ranging between 2.69 and 4.30 and the standard deviations between 0.813 and 1.306, the results indicate that a majority of the academics had begun conceptualizing and developing their entrepreneurial ideas, although still at their nascent stages it was empirically evident that they had already started the process of forming university spinoff firms.

**Table 4. 3 Response frequencies for creation of university spin-off firms/technology transfer process in Kenya.**

Statement	SD	D	N	A	SA	Mean	Std. Deviation
	%	%	%	%	%		
The “Publish or Perish” drive among academia is enhancing idea generation in the university.	5.8	8.1	13.6	57.7	14.7	3.67	1.013
Idea assessment for economic potential is intensively done at the university.	6.7	23.1	13.7	40.7	15.8	3.36	1.189
The university always identifies the owners of research results which the idea is based on.	7.8	19.2	20.5	39.6	13.0	3.31	1.151
Protection of the results from counterfeiting, copying, and imitations is not done.	6.8	23.6	15.7	37.8	16.0	3.33	1.194
There is production of a prototype that verifies the possibilities of industrial exploitation.	6.3	23.0	26.2	37.7	6.8	3.16	1.053
No business plan development is done to enhance the exploitation of the opportunity.	4.7	20.1	12.2	43.5	19.5	3.53	1.151
There is easy access to material and financial resources for prototyping and starting a business.	14.7	39.3	12.6	28.0	5.2	2.69	1.179
Personal relationships between university and the researcher are amiable.	3.1	12.3	21.5	47.6	15.4	3.60	.993
The university encourages relocation of business risk to high-growth markets and international arena.	3.6	19.8	22.7	43.2	10.7	3.37	1.032
The management ensures full exploitation of industrial potential of the technological projects.	5.3	23.9	19.4	36.1	15.4	3.32	1.151
Researches and technologies are not completely based on customer needs.	13.1	35.8	13.6	22.5	15.1	2.91	1.306
There is lack of solid rules and regulations for protecting Intellectual Property (IP) rights.	10.4	29.9	13.0	33.9	12.8	3.09	1.250
There is lack of seed-financing and human resources.	7.3	37.8	13.1	31.2	10.5	3.00	1.187
University managers are unclear about priorities and goals regarding technology transfer.	8.1	30.5	16.7	35.8	8.9	3.07	1.158
Informational and cultural barriers exist between university and industry hence lack of trust and respect.	13.1	30.4	12.9	31.5	12.1	2.99	1.277
Institutionalize the documentation and evaluation systems at the university in	1.8	5.8	5.8	53.0	23.1	3.90	.884

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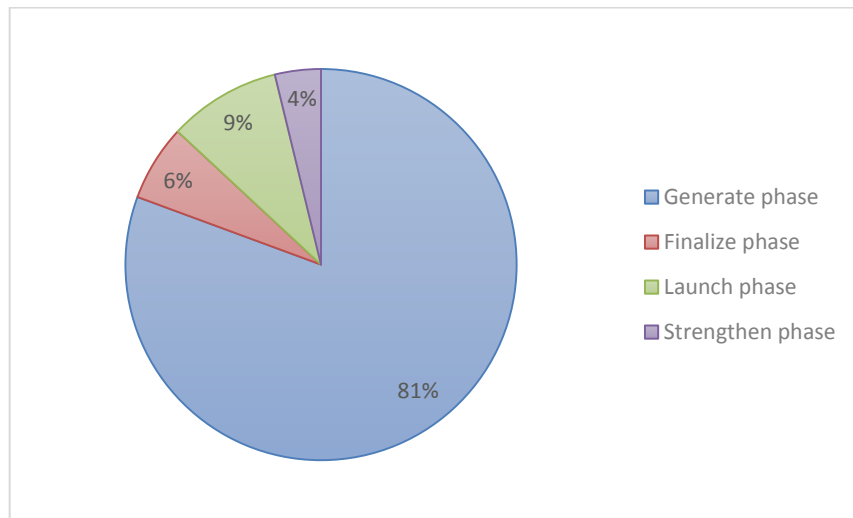
order to better protect Intellectual Property rights.								
Develop an appropriate regulatory structure and revise the existing rules and regulations.	2.6	4.5	8.1	56.0	28.8	4.04	.885	
Finance researches and innovations with both governmental and nongovernmental budgets and funds.	2.3	3.7	7.0	51.4	35.5	4.14	.875	
Government should offer tax exemptions in order to motivate investors.	3.4	6.5	6.0	36.6	47.5	4.18	1.035	
University should develop sales and marketing unit to assist in commercialization.	2.1	1.6	4.8	47.2	44.2	4.30	.813	

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$n=387, \bar{x}=3.44868, S=0.48969$

$SD=Strongly\ Disagree, D=Disagree, N=Neutral, A=Agree, SA=Strongly\ Agree$

The results in Figure 4.4 indicate that a majority of (81 %) the respondents were in the generate phase (*conception and development*), 9% on the launch phase (*commercialize*), 6% in the finalize phase (*growth*) and 4% in the strengthen phase (*stability*). This findings corroborate with a number of researchers who have over the years have developed models for examining businesses using business size as one dimension and company maturity or the stage of growth as a second dimension, being the most commonly used with the majority of them being is first stage (Kazanjian, 1988).



**Figure 4. 4 Phases of Creation of a University Spin-offs**

In an effort to understand the reasons why the respondents were in that particular phase, Table 4.4 showed that 47.8% indicated that they were still working on the idea, 18.2% were still acquiring necessary information for business, and 13.8% had inadequate resources and infrastructure. In addition, other reasons like; awaiting to complete studies, inadequate financial resources, encouraging others people to generate and start business were also presented.

**Table 4. 4 Explanation on the phases of the creation of university spin off firms**

Statement	Frequency	Percent
Still working on the idea	173	47.8
Still acquiring necessary information for business	66	18.2
Inadequate resources & infrastructure	50	13.8
Adequate resources	34	9.4
Awaiting to complete studies	27	7.8
Encouraging people to generate ideas	11	3.0
<b>Total</b>	<b>387</b>	<b>100</b>

**4.4.1.2 Discussions of the findings on Creation of University Spin-Off Firms/**



### **Technology Transfer Process (CUSOF/TTP)**

Creation of university Spin-Off firms (CUSOF) was measured using statements on a 5-point likert scale with 1= 'Strongly Disagree' and 5= 'Strongly Agree' that describes the four phases of creating a firm. The phase were: generate phase-originate a viable business idea (*conception and development*); finalize phase- scan, evaluate and translate the idea into a business process (*commercialize*); launch phase-create a firm (*growth*) and strengthen phase-contribute value to customers, employees, investors and all other stakeholders (*stability*). The empirical findings revealed that majority of (78%) the respondents were in the generate phase (*conception and development*), 10% on the launch phase (*commercialize*), 7% in the finalize phase (*growth*) and 5% in the strengthen phase (*stability*).

In summary, the descriptive results indicated that the 20 items in Table 4.3 characterize CUSOF/TTP were aggregated to get Y score for each respondent that is 3.4468. With the means ranged between 2.69 and 4.30 and the standard deviations between 0.813 and 1.306, the results indicate that a majority of the academics had started conceiving and developing their entrepreneurial ideas, although at the nascent stage they had already started the process of forming university spinoff firms but were facing numerous obstacles, difficulties, impediments, hindrances, and other sources of resistance (Ndonzuau et al., 2002).

Pattnaik and Pandey (2014) and Ndonzuau et al. (2002) observed that creation of the technology used by a university spinoff is a multi-stage process that is neither

straightforward nor spontaneous with different researcher have varied stages; While Ndonzuau et al. (2002) and Pattnaik and Pandey (2014) had four stages Shane (2004) and Vohora et al. (2004) had five stages. The fundamental component is not only the stages but the associated problems or critical junctures that prevents them moving to the next stage (Kazanjian, 1988; Vohora et al., 2004). The research findings showed that among the obstacles that academician are facing and hence preventing them from to the next phase were; inadequate resources and infrastructure, they are still working on the idea or they were gathering information about the business. This could be synchronized with Kazanjian (1988) problems that included resource acquisition, technology development, vendor relations, production start-up, growth of sales and market share, profitability and internal controls. It should be noted that although problems at every stages of growth do overlap, there is adequate support for a predictable pattern of problems faced by most of the firms as they grow and therefore they should be not be afraid to progress to the subsequent phase until the business idea if fully commercialized.

#### **4.4.2 Entrepreneurial self-efficacy influence on the creation of spin-off firms in Kenya.**

*Specific objective 1: To establish the influence of entrepreneurial self-efficacy on the creation of university spin-off firms in Kenya.*

The study set to investigate how entrepreneurial self-efficacy (ESE) influences the formation of university spin-off firms (CUSOF/TTP) in Kenya. The ESE was measured using statements placed on a 5-Point Likert scale, where 1 represented ‘Strongly Disagree (SD)’ and 5 represented ‘Strongly Agree (SA)’ but the adapted De Noble, Jung, & Ehrlich’s (1999) six-sub scales namely; developing new product or market opportunities,

building an innovative environment, initiating investor relationships, defining core purpose, coping with unexpected challenges, developing critical human resources.

#### **4.4.2.1 Descriptive Analysis on Entrepreneurial Self-Efficacy (ESE)**

Table 4.5 shows that 89.8% (M=4.15, SD=0.788) of the respondents agreed that they can discover new ways to improve existing products whereas 90.7 % (M=4.12, SD=0.762) indicated that they could see new market opportunities for new products and services. 73.9% (M=3.80, SD=1.133) of the respondents indicated that they cannot identify new areas for potential growth. 44.2 % (M=3.23, SD=1.151) of the respondents indicated that they struggle to bring product concepts to market in a timely manner while on the other hand 57.4% (M=3.45, SD=1.052) of the respondents observed that they tolerate unexpected changes in business conditions. Sixty nine point one percent (M=3.61, SD=1.179) of the respondents posited that they can work productively under continuous stress, pressure and conflict while at the same time 85.5% (M=4.04, SD=0.868) of the respondents opined that they can maintain a positive look despite setbacks and negative feedback from naysayers. 48.7% (M=3.19, SD=1.172) indicated that they struggle to identify and build management teams. In the study, 70.9 % (M= 3.68 SD=0.990) of the respondents observed that they can recruit and train key employees, while 77.3% (M=3.86, SD=0.965) of the respondents observed that they can focus on the demands of the business despite the inevitable conflict between one's personal and professional life. The findings showed that 60.8% (M=3.58, SD=1.193) of the respondents opined that they can hardly tap into the expertise of others while 69.3(M=3.66, SD=1.192) were of the opinion that they cannot convince others to join with them in pursuit of their entrepreneurial vision.

90% (M=4.09, SD=0.714) of the respondents observed that they can inspire others to embrace vision and values of the company.

Furthermore, 83.2 % (M=3.97, SD=0.919) of the respondents agreed that they could manage the negotiation process to obtain outcomes favorable to them whereas 57 % (M=3.37, SD=1.186) of the respondents agreed that they had difficulties in formulating set of actions in pursuit of their business opportunities. In the study, 88.6 % (M=4.08, SD=0.743) of the respondents opined that they could create a working environment that encourages people to try out something new. 89.9 % (M=4.12, SD=0.766) of the respondents observed that they could encourage people to take initiatives and responsibilities for their ideas and decisions, regardless of outcome. 50.1 % (M=3.14, SD=1.353) of the respondents opined that they struggle to develop and maintain favorable relationships with potential investors.

In summary, after achieving a Cronbach threshold of 0.842 (see Appendix 2), the 18 items in table 4.5 explaining the Entrepreneurial Self-Efficacy (ESE) were aggregated to get  $X_1$  score for each respondent that is  $\bar{x} = 3.7288$ . With the means ranging between 3.14 and 4.15 and the standard deviations between 0.743 and 1.353 the results may be interpreted that majority of respondents perceived that they had the immense individual capabilities for creating a university spin-off firms and being a successful entrepreneurs (Naktiyok, Karabey, & Gulluce, 2009). Moreover, the statements were meant to measure the “I can do it” feeling in embarking on a task. From this end, self-efficacy belief of the academic, that is perceived to execute the required activities for the creating of a spinoff firm,

positively affects the entrepreneurial intention (Krueger & Carsrud, 1993). Drnovšek, Wincent, & Cardon (2010) in their study 'entrepreneurial self-efficacy and business start-up: developing a multi-dimensional definition' concludes by noting that the higher the self-efficacy beliefs, the greater an entrepreneur's perceived competence for successfully starting a new business and, consequently, the more positive the intent. Increased strength of beliefs in one's capabilities to start-up is likely to promote mobilization and allocation of energy and resources to pursue business start-up goals, if they are desirable.

**Table 4. 5 Response frequencies for Entrepreneurial Self Efficacy (ESE)**

<b>Statement</b>	<b>SD</b>	<b>D</b>	<b>N</b>	<b>A</b>	<b>SA</b>	<b>Mean</b>	<b>Std. Deviation</b>
	<b>%</b>	<b>%</b>	<b>%</b>	<b>%</b>	<b>%</b>		
I can discover new ways to improve existing products	1.0	4.7	4.4	58.3	31.5	4.15	.788
I can see new market opportunities for new products and services.	1.0	4.7	3.6	63.0	27.7	4.12	.762
I cannot identify new areas for potential growth.	4.7	13.3	8.1	45.4	28.5	3.80	1.133
I struggle to bring product concepts to market in a timely manner.	4.7	27.4	23.8	28.5	15.7	3.23	1.151
I do not tolerate unexpected changes in business conditions.	3.1	19.6	19.8	43.6	13.8	3.45	1.052
I can work productively under continuous stress, pressure and conflict.	7.0	15.3	8.6	48.1	21.0	3.61	1.179
I can maintain a positive look despite setbacks and negative feedback from naysayers.	2.8	3.4	8.3	57.5	28.0	4.04	.868
I struggle to identify and build management teams.	6.7	28.5	16.1	36.5	12.2	3.19	1.172
I can recruit and train key employees.	4.4	9.6	15.1	55.8	15.1	3.68	.990
I can focus on the demands of the business despite the inevitable conflict between one's personal and professional life.	3.9	6.2	12.7	54.8	22.5	3.86	.965
I hardly tap into the expertise of others.	4.7	19.2	15.3	35.2	25.6	3.58	1.193
I do not convince other to join with me in pursuit of my vision.	5.2	18.5	7.0	43.8	25.5	3.66	1.192
I can inspire others to embrace vision and values of the company.	0.8	3.7	5.5	65.5	24.5	4.09	.714
I can manage the negotiation process to obtain outcomes favorable to me.	2.6	6.8	7.3	57.1	26.2	3.97	.919
I have difficulties in formulating set of actions in pursuit of my business opportunities.	6.0	24.6	12.4	40.9	16.1	3.37	1.186
I can create a working environment that encourages people to try out something new	0.5	4.9	6.0	63.3	25.3	4.08	.743
I can encourage people to take initiatives and responsibilities for their ideas and decisions, regardless of outcome.	1.3	3.6	5.2	61.3	28.6	4.12	.766
I struggle to develop and maintain favorable relationships with potential investors.	14.5	24.5	10.9	32.8	17.3	3.14	1.353

$n=387, \bar{x}=3.7288, S=0.52443$

$SD=Strongly Disagree, D=Disagree, N=Neutral A=Agree, SA= Strongly Agree$

Table 4.6 indicate ways that participants argued that they can improve their capabilities in recognizing their entrepreneurial opportunities and new product development from university research. In the study, 48.2% of the respondents indicated that attending conferences, workshops & seminars to develop skills will tremendously boost their aptitude for new venture creation. While, 14.6% of respondents posited that brainstorming, embrace vision, values of the company was significant, 12.7 of respondents agreed that carrying out research and entrepreneurial trends was the most important. In addition, 12.4 % portended putting ideas into practice while having a mentor guide and adequate financing had 9.7 % and 2.4% respectively.

**Table 4. 6 Ways you can improve your own capabilities in recognizing entrepreneurial opportunities and new product development from university research**

<b>Statement</b>	<b>Frequency</b>	<b>Percent</b>
Attending conferences, workshops & seminars to develop skills	179	48.2
Brainstorming & embrace vision & values of the company	54	14.6
Carrying out research and entrepreneurial trends	47	12.7
Putting ideas into practice	46	12.4
Have mentors to guide	36	9.7
Adequate financing	9	2.4
<b>Total</b>	<b>387</b>	<b>100.0</b>

#### **4.4.2.2 Correlation results on Entrepreneurial Self-Efficacy (ESE) and Creation of University Spin-Off Firms/ Technology Transfer Process (CUSOF/TTP)**

The study sought to establish the linear relationship between Entrepreneurial Self-Efficacy (ESE) and Creation of University Spin-Off Firms/ Technology Transfer Process (CUSOF/TTP). The Table 4.7 shows that there is positive correlation between ESE and

the CUSOF/TTP,  $r(387) = 0.367$ ,  $p\text{-value} < .001$ . Therefore, an increase in use of ESE led to an increase in CUSOF/TTP.

**Table 4. 7 Correlation results on Entrepreneurial Self-Efficacy (ESE) and Creation of University Spin-Off Firms/ Technology Transfer Process (CUSOF/TTP)**

		ESE	CUSOF/TTP
<b>ESE</b>	Pearson Correlation	1	.367**
	Sig. (2-tailed)		.000
	N	387	387

\*\* . Correlation is significant at the 0.01 level (99% confidence level) (2-tailed).

**4.4.2.3 Regression results on Entrepreneurial Self-Efficacy (ESE) and Creation of University Spin-Off Firms/ Technology Transfer Process (CUSOF/TTP)**

Having known from the correlation analysis that there is a positive relationship between ESE and CUSOF/TTP a regression analysis was conducted to establish the extent to which ESE influences CUSOF/TTP. A hypothesis to guide the research was as follows;

**Hypothesis  $H_{01}$ :** *Entrepreneurial self-efficacy has no significant influence on the creation of university spin-off firms in Kenya.*

To test the hypothesis, the model  $Y = \beta_0 + \beta_1 X_1 + \varepsilon$  that was significant ( $p < 0.01$ ) was fitted

**Where**  $Y$  - CUSOF/TTP

$\beta_0$  - Constant

$\beta_1$  - Co-efficient 1

$X_1$  - ESE

$\varepsilon$  - Error term

Table 4.8 presents Model 1m with ESE as independent variable. The model shows that relationship between ESE and CUSOF/TTP is significant ( $F(1, 384) = 57.592$ ,  $p < 0.001$ )



and  $R^2=0.134$  meaning that 13.4 % of CUSOF/TTP can be explained by ESE with the difference that is 86.6% described by other factors outside the model. Furthermore,  $\beta$  co-efficient for ESE was significant ( $\beta =0.367$ ,  $t=7.720$ ,  $p<0.001$ ) meaning that that for every 1unit increase in ESE there was an equivalent increase by 0.367 in CUSOF/TTP.

Hence, the model equation for ESE was;

$$\text{Model 1m } Y = \beta_0 + \beta_1 X_1 + \varepsilon$$

$$\text{CUSOF/TTP}=2.172+0.342\text{ESE}$$

In conclusion, the results confirm that ESE has significant influence on the CUSOF/TTP and hence null hypothesis,  $H_{01}$  is therefore rejected.

**Table 4. 8 Regression results on Entrepreneurial Self-Efficacy (ESE) and the Creation of University Spin-off Firms (CUSOF/TTP)**

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1m	.367 <sup>a</sup>	.134	.132	.45620		
ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1m	Regression	12.402	1	12.402	59.592	.000 <sup>a</sup>
	Residual	79.918	384	.208		
	Total	92.320	385			
Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1m	(Constant)	2.172	.167		13.029	.000
	ESE	.342	.044	.367	7.720	.000
a. Predictors: (Constant), Entrepreneurial Self-Efficiency (ESE)						
b. Dependent Variable: Creation of university Spin-Off Firms/Technology Transfer process (CUSOF/TTP)						

#### **4.4.2.4 Discussion of findings on the relationship between Entrepreneurial Self-Efficacy (ESE) and Creation of Spin-off Firms (CUSOF/TTP).**

Entrepreneurial Self Efficacy (ESE) was measured using 5-point likert scale with 1= 'Strongly Disagree' and 5= 'Strongly Agree' statements derived from the six major dimensions of ESE perception adapted from De Noble et al (1999). There were; (1) developing new product or market opportunities (skills related with opportunity recognition); (2) Building an innovative environment (skills related with the capacity to encourage others); (3) Initiating investor relationships (skills related with obtaining funds to capitalize the start-up company); (4) Defining core purpose (mission and vision creation and communication skills to attract key staff and investors); (5) Coping with unexpected challenges (skills to cope with risky and uncertain situations); (6) Developing critical human resources (skills to employ and develop human resources).

In summary, the 18 items in table 4.5 explaining the Entrepreneurial Self-Efficacy (ESE) were aggregated to get  $X_1$  score for each respondent that is  $\bar{x} = 3.7288$  and  $S = 0.52443$ . With the means ranging between 3.14 and 4.15 and the standard deviations between 0.743 and 1.353. Therefore, with  $\bar{x} = 3.7288$ , the researcher deduced that majority of the respondents were in agreement with statements while on the other hand,  $S = 0.52443$  meant that significant amount of the values in a statistical data set were close to the mean. This outcome was interpreted that great part of respondents perceived that they had the immense individual capabilities of creating a university spin-off firms and being a successful entrepreneurs (Naktiyok et al., 2009).

With regard to inferential analysis, the study findings showed that there is positive correlation between ESE and the CUSOF/TTP ( $r(387) = 0.367$ ,  $p\text{-value} < 0.001$ ). Therefore, an increase in use of ESE led to an increase in CUSOF/TTP. The model shows that relationship between ESE and CUSOF/TTP is significant ( $F(1, 384) = 57.592$ ,  $p < 0.001$ ) and  $R^2 = 0.134$  meaning that 13.4 % of CUSOF/TTP can be explained by ESE with the difference that is 86.6% described by other factors outside the model. Furthermore,  $\beta$  co-efficient for ESE was significant ( $\beta = 0.367$ ,  $t = 7.720$ ,  $p < 0.001$ ) meaning that that for every 1 unit increase in ESE there was an equivalent increase by 0.367 in CUSOF/TTP. From the empirical findings it was confirmed that ESE increases the intention of launching a new venture according to a host of researchers. Prodan and Drnovsek (2010) investigated the determinants of academic entrepreneurial intention. They found that the entrepreneurial intentions of academics were important in predicting the dynamics in the emergence of firms with high growth potential. For instance, in a study conducted on 140 undergraduate students, it was observed that there was a positive and significant relationship between ESE perception including entrepreneurial skills such as marketing, innovation, management and financial control, risk taking, and entrepreneurial intention. The researchers opined that academics with higher self-efficacy effectively evaluated the entrepreneurial opportunities were able to achieve positive outcomes (Chen et al., 1998). This study corroborates with Chen et al (1998) whose simple correlations showed that gender, age and education of the business executives did not have significant relations with ESE scores, except that age was positively related to self-efficacy of financial control ( $r = 0.17$ ,  $p\text{-value} < 0.05$ ). Having a parent or sibling who was an entrepreneur did

not seem to affect ESE. However having start-up experience was positively correlated with total ESE ( $r = 0.15$ ,  $p$ -value  $< .05$ ) and self-efficacy of innovation ( $r = 0.21$ ,  $p$ -value  $< .01$ ). In addition, it was reported that self-evaluation capability had direct effects on launching a venture (Chandler & Hanks, 1994). In another research conducted on 272 students, it was found out that there was a significant and positive relationship between ESE perception, including risk and uncertainty management, innovation and product improvement, interpersonal relations and network management, opportunity recognition, finding resources, developing and maintaining the innovative business environment and entrepreneurial intention (De Noble et al., 1999). Moreover, Naktiyok et al. (2009) indicated that ESE perceptions of respondents was rather positive with a positive relationship between entrepreneurial intention and ESE. The dimension of “defining core purpose” had the highest mean value (4.01) and the dimension of “coping with unexpected difficulties” had the lowest (3.44). In other words, students had a strong beliefs in their capability and capacity to determine and articulate the goal and direction of the newly launched enterprise.

#### **4.4.3 Personal and professional networks influence on the creation of spin-off firms in Kenya.**

*Specific objective 2: To determine the influence of personal and professional networks on the creation of university spin-off firms in Kenya.*

The research set to examine how academics personal and professional networks (PPN) influences the creation of university spin-offs firms (CUSOF/TTP) in Kenya. PPN was

measured using statements drawn from informal, formal and non-formal interactions of academics but placed on a 5-Point Likert scale, where 1 represented ‘Strongly Disagree (SD)’ and 5 represented ‘Strongly Agree (SA)’.

#### **4.4.3.1 Descriptive Analysis on Personal and Professional Networks (PPN)**

In Table 4.9, the findings revealed that 46.1 % (M=3.06, SD=1.220) of the respondents agreed that they have insufficient time within the normal working/learning for consultancy assignments period whereas 63.3% (M=3.42, SD=1.119) of the respondents opined that they regularly attend scientific and technological workshops and conferences. In the study, 41.9 % (M=3.06, SD=1.172) of the respondents observed that there was minimal involvement of technology transfer office in developing and enhancing academic-industry relations. In addition, 55.6% (M=3.38, SD=1.118) of the respondents mentioned that the industry does not provide entrepreneurs with information on market and new opportunities.

Forty two point four percent (M=3.08, SD=1.094) of the respondents observed that rules and regulations for academic-industry interactions were fully enforced whereas 55.6% (M=3.42, SD=1.150) opined that the industry denies researchers the opportunity to test and eventually license their new discovery. In the study, 58.4% (M=3.46, SD=1.198) of the respondents revealed that the industry provided entrepreneurs with tangible resources (e.g., human resources, financial resources) whereas 65% (M=3.64, SD=1.157) of the respondents indicated that the industry gave entrepreneurs in-tangible resources (e.g., social support, problem solving). 93% (M=4.32, SD=0.762) of the respondents observed that universities should make use of alumni to expand network with industry with 92.2%

(M=4.28, SD=0.769) of the respondents indicating that universities should create offices of economic development & entrepreneurship.

In summary, after achieving a Cronbach threshold of 0.734 (see Appendix 2), the 10 items in table 4.9 describing the personal and professional networks (PPN) were aggregated to get  $X_2$  score for each respondent that is  $\bar{x}=3.5111$ . With the means ranging between 3.08 and 4.32 and the standard deviations between 0.762 and 1.220, the results indicate that a majority of the academics were in agreement with the statements had were engaged in networking various activities to improve their acumen for commercialization.

**Table 4. 9 Response frequencies for Personal and Professional Networks**

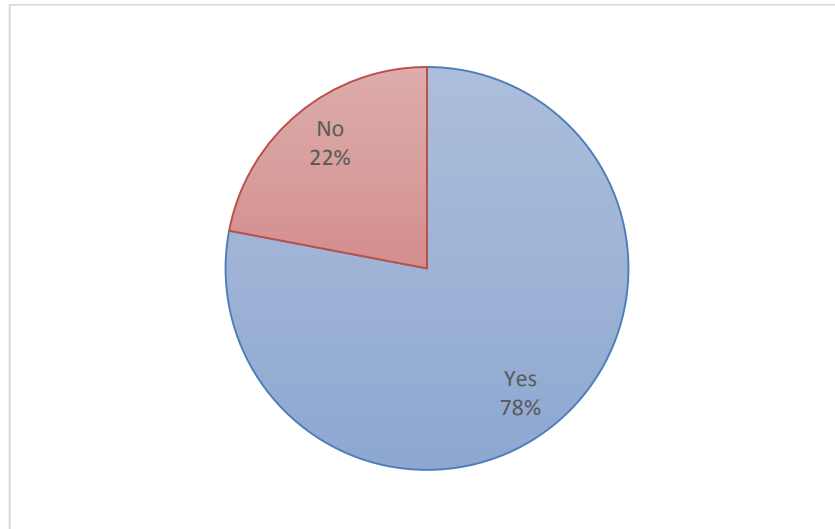
<b>Statement</b>	<b>SA</b>	<b>D</b>	<b>N</b>	<b>A</b>	<b>SA</b>	<b>Mean</b>	<b>Std. Deviation</b>
	%	%	%	%	%		
I have insufficient time within the normal working/learning for consultancy assignments period.	8.3	34.8	10.4	35.1	11.4	3.06	1.220
I regularly attend scientific and technological workshops and conferences.	5.5	21.9	9.4	51.3	12.0	3.42	1.119
There is minimal involvement of technology transfer office in developing and enhancing academic-industry relations.	6.5	34.4	17.2	30.2	11.7	3.06	1.172
The industry does not provide entrepreneurs with information on market and new opportunities.	3.4	25.8	15.2	41.0	14.6	3.38	1.118
Rules and regulations for academic-industry interactions are fully enforced.	6.8	28.3	22.5	35.1	7.3	3.08	1.094
The industry denies researchers the opportunity to test and eventually license their new discovery.	4.2	23.4	16.8	37.8	17.8	3.42	1.150
The industry provides entrepreneurs with tangible resources (e.g., human resources, financial resources).	5.5	22.1	14.1	37.8	20.6	3.46	1.198
The industry gives entrepreneurs in-tangible resources (e.g., social support, problem solving).	5.2	14.9	14.9	40.2	24.8	3.64	1.157
University should make use of alumni to expand network with industry.	1.6	1.6	3.9	49.0	44.0	4.32	.762
University should create offices of economic development & entrepreneurship.	1.8	1.3	4.7	51.8	40.4	4.28	.769

$n=387, \bar{x}=3.5111, S=0.58844$

$SD=Strongly Disagree, D=Disagree, N=Neutral A=Agree, SA= Strongly Agree$

**My university encourage you to have direct contacts with industry players on networking and interaction opportunities**

The respondents were asked to state whether their respective universities encourages them to have direct contacts with industry players on networking and interaction opportunities, the results in Figure 4.5 indicated that 78% said yes while 22% said No.



**Figure 4. 5 Level of encouragement by University to contact industry players**

Table 4.10 presents the reasons behind the responses in Figure 4.5. From the study, 40.1 % of the respondents suggested that they needed to organize seminars, workshops & dinners to expose them to industry players while on the other hand 16.5% of respondents observed that little effort done by universities to enhance University-Industry contact. Similarly, 13.5% of the respondents indicated that this could be enhanced through income generating activities within departments. 12.5% of respondents commanded that this could be done through regularly inviting guest speakers for career guidance. Lastly, factors like; to expose academics to practical skills and create employment relevant industry were less than 10%.



**Table 4. 10 Explanations to why university encourages academics to have direct contacts with industry players on networking and interaction opportunities**

Statement	Frequency	Percent
Organize seminars, workshops & dinners to expose them to industry players	155	41.3
Little effort done by universities	64	17.1
Through income generating activities within departments	53	14.1
Inviting guest speakers for career guidance	48	12.8
Make them familiar to practical skills	29	7.7
Create employment in the industry attached	26	6.9
Total	387	100.0

**4.4.3.2 Correlation results on Personal and Professional Networks (PPN) and Creation of University Spin-Off Firms/ Technology Transfer Process (CUSOF/TTP)**

The research established the linear relationship between Personal and Professional Networks (PPN) and Creation of University Spin-Off Firms/Technology Transfer Process (CUSOF/TTP). The Table 4.11 shows that there is positive correlation between PPN and the CUSOF/TTP,  $r(387) = 0.573$ ,  $p\text{-value} < .001$ . Therefore, an increase in use of PPN led to an increase in CUSOF/TTP.

**Table 4. 11 Correlation results on Personal and Professional Networks (PPN) and Creation of University Spin-Off Firms/ Technology Transfer Process (CUSOF/TTP)**

		PPN	CUSOF/TTP
PPN	Pearson Correlation	1	.573**
	Sig. (2-tailed)		.000
	N	387	387

\*\* . Correlation is significant at the 0.01 level (99% confidence level) (2-tailed).

**4.4.3.3 Regression results on Personal and Professional Networks (PPN) and Creation of University Spin-Off Firms/ Technology Transfer Process (CUSOF/TTP)**

From the correlation analysis shown above it is clear that there is a positive relationship between PPN and CUSOF/TTP, a regression analysis was conducted to establish the

extent to which PPN influences CUSOF/TTP. A hypothesis to guide the research was as follows;

**Hypothesis H<sub>02</sub>:** *Personal and Professional Networks (PPN) has no significant influence on the creation of university spin-off firms in Kenya.*

To test the hypothesis, the model  $Y = \beta_0 + \beta_2 X_2 + \varepsilon$  that was significant ( $p < 0.01$ ) was fitted

**Where**  $Y$  - CUSOF/TTP

$\beta_0$  - Constant

$\beta_2$  - Coefficient, 2

$X_2$  - PPN

$\varepsilon$  - Error term

Table 4.12 presents Model 2m with PPN as independent variable. The model shows that relationship between PPN and CUSOF/TTP is significant ( $F(1, 382) = 186.715, p < 0.001$ ) and  $R^2 = 0.328$  meaning that 32.8 % of CUSOF/TTP can be explained by PPN with the difference that is 67.2% described by other factors outside the model. Furthermore,  $\beta$  co-efficient for PPN was significant ( $\beta = 0.573, t = 13.664, p < 0.001$ ) meaning that that for every 1 unit increase in PPN there was an equivalent increase by 0.573 in CUSOF/TTP.

Hence, the model equation for PPN was;

$$\text{Model 2m } Y = \beta_0 + \beta_2 X_2 + \varepsilon$$

$$\text{CUSOF/TTP} = 1.784 + 0.474 \text{PPN}$$

In conclusion, the results confirm that PPN has significant influence on the CUSOF/TTP and hence null hypothesis,  $H_{02}$  is therefore rejected.

**Table 4. 12 Regression results on Personal and Professional Networks (PPN) and the Creation of University Spin-off Firms (CUSOF/TTP)**

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
2m	.573 <sup>a</sup>	.328	.327	.40026		
ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
2m	Regression	29.914	1	29.914	186.715	.000 <sup>a</sup>
	Residual	61.200	382	.160		
	Total	91.114	383			
Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
2m	(Constant)	1.784	.124		14.429	.000
	PPN	.474	.035	.573	13.664	.000

a. Predictors: (Constant), Personal and Professional Networks (PPN)  
b. Dependent Variable: Creation of university Spin-Off Firms/Technology Transfer process(CUSOF/TTP)

**4.4.3.4 Discussion of findings on the relationship between Personal and Professional Networks (PPN) and Creation of Spin-off firms (CUSOF/TTP).**

Personal and Professional Networks was measured using 5-point likert scale with 1= ‘Strongly Disagree’ and 5= ‘Strongly Agree’ statements derived from: (1) private/informal collaborations; (immediate personal environment consisting of family members and close friends); (2) commercialization/ formal collaborations (commercial exploitation of technology or knowledge through patenting, spin-off and licensing); (3) research-related/non-formal collaborations (joint research, contract research, consulting, learning (gaining new insights, receiving feedback on research, and accessing new knowledge through engagement with industry), access to funding (complementing public

research monies with funding from industry); and Access to in-kind resources (using industry-provided equipment, materials and data for research). In summary, the 10 items in table 4.9 describing the personal and professional networks (PPN) were aggregated to get  $X_2$  score for each respondent that is  $\bar{x}=3.5111$  and  $S=0.58844$ . With the means ranging between 3.08 and 4.32 and the standard deviations between 0.762 and 1.220. The results indicate that a majority of the academics were in agreement with the statements that they were engaged in networking various activities to improve their acumen for commercialization ( $\bar{x}=3.5111$ ,  $S=0.58844$ ).

Furthermore, the inferential analysis showed that there was a positive correlation between PPN and the CUSOF/TTP ( $r(387)=0.573$ ,  $p\text{-value}<.001$ ). Therefore, an increase in use of PPN led to an increase in CUSOF/TTP. The model shows that relationship between PPN and CUSOF/TTP is significant ( $F(1, 382)=186.715$ ,  $p<0.001$ ) and  $R^2=0.328$  meaning that 32.8 % of CUSOF/TTP can be explained by PPN with the difference that is 67.2% described by other factors outside the model. Furthermore,  $\beta$  co-efficient for PPN was significant ( $\beta=0.573$ ,  $t=13.664$ ,  $p<0.001$ ) meaning that that for every 1 unit increase in PPN there was an equivalent increase by 0.573 in CUSOF/TTP.

These findings could be informing policy makers in higher learning institutions and government authorities seeking to further promote the emergence of entrepreneurial activities in the academic world, by fostering effective entrepreneurial networks for academics early in their careers (Fernández-Pérez et al., 2015). This findings are

supported by Bozeman, Dietz and Gaughan (2001) and Murray (2004) who argued that that academics who form part of business networks have access to business-related information, resources and positive recommendations. They observed that these links could encourage academics to dedicate more time to gaining a richer understanding of work practices and skills in the private sector. These benefits, in turn, may strengthen their sense of control over their potential to achieve success as entrepreneurs (Ozgen & Baron, 2007). Academics who customarily collaborate with firms are more attuned to recognizing the commercial opportunities arising from their own investigations (Bercovitz & Feldman, 2008) and more likely to submit patent applications (Oliver, 2004).

Ozgen and Baron (2007) and Fernández-Pérez et al (2015) further concurs with the study findings that conferences, seminars and workshops have been viewed as formal channels of current developments and information for academics who wish to gain further knowledge in their field. Such encounters provide a means by which participants can maintain or raise their level of entrepreneurial competence, and are reinforced by current trends in favour of “open science” and the transfer of research findings to the productive world. The existence of a common vocabulary among colleagues, together with shared attitudes and skills and the access to potential resources, could enhance the level of perceived control in a new entrepreneurial process (De Carolis et al., 2009). In this respect, too, Johannisson (1991) suggested that the presence of role models could have a positive impact on self-efficacy.

Fernández-Pérez et al (2015) posits that both personal networks (family, friends and colleagues) and professional networks (mentors, business networks and professional forums) enhances the creation of spin-off firms. According to Shane (Shane, 2000), knowledge about markets, technologies and consumer needs contributes strongly to forming positive attitudes toward entrepreneurship and relevant skills, and this knowledge or experience is gained, fundamentally, by close interaction with business partners. Family members and close friends play a key role in socialization toward entrepreneurship (Chang, Memili, Chrisman, Kellermanns, & Chua, 2009). The immediate personal environment impacts on values, attitudes and skills which may propel the academic researcher toward entrepreneurship. On many occasions, emotional support from the immediate circle of “reference people” is a crucial factor in a would-be entrepreneur’s decision to proceed (Liñán & Santos, 2007).

#### **4.4.4 Co-operation with industry influence on the creation of spin-off firms in Kenya.**

***Specific objective 3:** To investigate the influence of cooperation with the industry on the creation of university spin-off firms in Kenya.*

The research set to found out how cooperation with the industry (CWI) influences the formation of university spin-off firms (CUSOF/TTP) in Kenya. The CWI was measured using constructs developed from four areas: financial, technological, strategic, educational and political but placed on a 5-Point Likert scale, where 1 represented ‘Strongly Disagree (SD)’ and 5 represented ‘Strongly Agree (SA).

#### 4.4.4.1 Descriptive Analysis on Co-operation with Industry (CWI)

The results in Table 4.13 shows that 1.5% strongly disagreed, 6.8 % disagreed, 10.7 % neither disagree nor agree, 55.5% agree and 25.4% strongly agree. In comparative terms, the results in Table 4.13 showed that the overall  $\bar{x}=3.96$  ( $S=0.857$ ) falling in neither agree or disagree region. The mean scores for the sub-scales were: financial ( $\bar{x}=4.0$ ,  $S=0.801$ ); technological ( $\bar{x}=4.1$ ,  $S=0.745$ ); strategic ( $\bar{x}=3.98$ ,  $S=0.851$ ); educational ( $\bar{x}=3.78$ ,  $S=0.981$ ) and political ( $\bar{x}=3.95$ ,  $S=0.924$ ). The study showed that the academic observed themselves to have above average cooperation with industry, with technology being the most important aspect of co-operation. These findings are in complete contrast with Montoro-Sanchez et al. (2006) that analyzed the reasons by categories where they observed that strategic motives are the most important, followed by the financial and technological ones. Educational and political motivations were valued the least in the ranking. The results are also inconsistent with those by Freitas et al. (2013), who ranks the three reasons considered in that study as : improvement of competitive; positioning; access to new markets and cost reduction. These different results could be explained by the fact that the study sample includes 27.9 % (the majority) of the respondents that were drawn from Information Technology/ Computer Science department and there is likelihood of their biasness towards technology and related disciplines.

The results in 4.13, further indicate that the academics had the highest score in the key thematic areas that were at the centre of their co-operation with the industry. On top of the list were: To increase number of innovations on products and processes ( $\bar{x}=4.16$ ,  $S=0.731$ ) and to access firm's resources knowledge, technologies and their best practices

( $\bar{x}=4.15$ ,  $S=0.703$ ) coming from *technology segment*; to access to new markets ( $\bar{x}=4.10$   $S=0.726$ ) and to access strategic resources of the firms ( $\bar{x}=4.08$   $S=0.768$ ) coming from *strategic section*; to access additional and alternative financial resources sources including national and county governments grants ( $\bar{x}=4.07$   $S=0.785$ ) coming from *financial part* ; to improve the University's image/prestige/reputation ( $\bar{x}=4.06$   $S=0.899$ ) coming from *strategic section* ; to gain financial support ( $\bar{x}=3.94$   $S=0.818$ ) derived from *financial part*. Hence it was concluded that technological (Autio, Hameri, & Nordberg, 1996; Fritsch & Schwirten, 1999); strategic (López-Martínez, Medellín, Scanlon, & Solleiro, 1994; Siegel, Waldman, & Link, 2003; Wallmark, 1997) and financial were the main area of co-operations between university-industry.

Comparatively, Montoro-Sanchez et al. (2006) presented similar results although not in the same arrangement; additional and alternative financial sources (financial), the improvement of image and reputation (strategic), the access to the firm's technology, knowledge and experience (technological) and the securing of public subsidies(financial). Additionally, it is exceptional to note that education section that had parameters like; to facilitate mobility of the firm's staff ( $M=3.68$   $SD=1.048$ ) and to assist in the citations and publications in specialized journals, doctoral dissertations, research projects and the presentation of research results at conferences and workshops ( $M=3.98$   $SD=0.873$ ) were amongst the lowest valued and yet the study was being carried out in higher learning institutions. These results defy conclusions from other studies on industry–university relationships (Autio et al., 1996; Fritsch & Schwirten, 1999; Senker & Senker, 1997). These different results could be explained by the fact that the study sample included 88%



bachelors who were still preparing to either undertake their industrial attachment or conduct their first research project compare to combined 12% postgraduate who already researching and writing their thesis and dissertations.

**Table 4. 13 Response frequencies for Co-operation With Industry**

<b>Statement</b>	<b>SD</b>	<b>D</b>	<b>N</b>	<b>A</b>	<b>SA</b>	<b>Mean</b>	<b>Std. Deviation</b>
	%	%	%	%	%		
<b>a) Financial</b>							
To gain financial support.	1.3	6.1	10.5	61.6	20.5	3.94	.818
To access additional and alternative financial resources sources including national and county governments grants.	1.3	3.9	8.1	60.3	26.4	4.07	.785
<i>Sub-Average</i>	1.3	5.0	9.3	61.0	23.5	4.00	.801
<b>b) Technological</b>							
To access firm's resources, knowledge, technologies and their best practices.	0.3	3.9	5.2	62.3	28.4	4.15	.703
To increase number of innovations on products and processes.	0.3	4.4	5.2	59.5	30.6	4.16	.731
<i>Sub-average</i>	0.6	4.4	6.5	61.0	27.5	4.1	0.745
<b>c) Strategic</b>							
To maintain and improve University's competitive advantage.	1.0	6.3	8.1	58.2	26.4	4.03	.831
To reduce risk.	2.9	14.5	16.4	47.5	18.7	3.65	1.033
To access to new markets.	0.5	3.6	7.6	61.5	26.8	4.10	.726
To access strategic resources of the firms.	0.5	3.4	12.5	54.9	28.6	4.08	.768
To improve the University's image/prestige/reputation.	2.1	5.2	9.4	51.4	32.0	4.06	.899
<i>Sub-Average</i>	1.4	6.6	10.8	54.7	26.5	3.98	0.851
<b>d) Educational</b>							
To conduct recruitment and train employees.	1.6	12.8	14.4	48.0	22.2	3.74	1.024
To facilitate mobility of the firm's staff.	4.2	11.2	17.7	46.8	20.3	3.68	1.048
To assist in the citations and publications in specialized journals, doctoral dissertations, research projects and the presentation of research results at conferences and workshops.	1.3	6.5	14.1	53.5	24.5	3.93	.873
<i>Sub-Average</i>	2.4	10.2	15.4	49.4	22.3	3.78	0.981
<b>e) Political</b>							
To help Political in the adaptation to governmental initiatives.	2.6	6.8	9.4	55.6	25.7	3.95	.924
<i>Sub-Average</i>	2.6	6.8	9.4	55.6	25.7	3.96	.924

Grand Average	1.5	6.8	10.7	55.5	25.4	3.96	0.857
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$n=387, \bar{x}=3.6368, S=0.43675$

$SD=Strongly\ Disagree, D=Disagree, N=Neutral\ A=Agree, SA= Strongly\ Agree$

In addition to investigating the five basis upon which the researchers engage with external contacts during commercialization process, respondents were in Table 4.14 also presented with various statements to give their responses on a 5-point Likert scale the level co-operation with the industry influences the creation on university spin-off firms.

Eighty point seven percent (M=3.90, SD=0.869) of the respondents agreed that university has built collaborations with industry, academic institutions and other related parties like NGO whereas 56% (M=3.41, SD=1.132) observed that negotiations for university-industry collaborations and partnerships are transparent and efficient. 62.5% (M=3.56, SD=0.957) of the respondents agreed that industry-university collaboration centers have influenced the flow of trade by patenting and marketing university research. These findings corroborate with variant scholars and policy makers that recognize that collaboration between industry and the public research institutions is a necessity for innovation and national economic development (Abramo et al., 2011; Arvanitis, Kubli, & Woerter, 2008; Dill, 1995; Freitas et al., 2013; Lockett et al., 2003).

In the study, 33% (M=2.79, SD=1.156) of the respondents indicated that there had insufficient financial resources for research commercialization. Forty five point nine percent (M=3.10, SD=1.193) observed that there is a deficiency of skills in innovation and intellectual property management. However, 37.8% (M=2.97, SD=1.117) noted that there

were rigid University's rules and regulations that suppress external collaborations. Thirty six point six percent (M=2.89, SD=1.217) agreed that there were weaknesses in networking and co-operation with external parties. These sentiments were echoed by 41% (M=2.92, SD=1.189) of the respondents who alluded to the fact that there is inadequate information on suitable collaborative partners. Thirty three percent (M=2.91, SD=1.065) observed that there exist appropriate business models for partnership.

In summary, after achieving a Cronbach threshold of 0.852 (see Appendix 2), the 23 items in combined Tables 4.13 and 4.14 explaining the co-operation with industry (CWI) were aggregated to get  $X_3$  score for each respondent that is. 3.6368. With the means ranging between 3.68 and 4.15 and the standard deviations between 0.703 and 1.048, the results indicate that a majority of the academics agreed with the statements and were employing various collaborations with industry players to enhance their ability to create spin-off firms.

**Table 4. 14 Response frequencies for Co-operation with Industry**

Statement	SD	D	N	A	SA	Mean	Std. Deviation
	%	%	%	%	%		
University has built collaborations with industry, academic institutions and other related parties like NGOs.	2.6	5.5	11.2	60.9	19.8	3.90	.869
Negotiations for university-industry collaborations and partnerships are transparent and efficient.	6.5	17.0	20.4	40.8	15.2	3.41	1.132
Industry-university collaboration centers have influenced the flow of trade by patenting and marketing university research.	2.9	12.4	22.2	50.3	12.2	3.56	.957
There are insufficient financial resources for research commercialization.	8.9	44.6	13.4	24.9	8.1	2.79	1.156
There is a deficiency of skills in innovation and intellectual property management.	8.7	29.4	16.0	34.9	11.0	3.10	1.193
There are rigid University's rules and regulations on external collaborations.	7.8	32.5	21.6	30.2	7.6	2.97	1.117
There are weaknesses in networking and co-operation with external parties.	10.7	37.2	15.4	25.9	10.7	2.89	1.217
There is inadequate information on suitable collaborative partners.	10.2	36.6	12.3	33.2	7.8	2.92	1.189
There exist inappropriate business models for partnership.	8.4	30.9	27.7	27.5	5.5	2.91	1.065

$n=387$ ,  $\bar{x}=3.7542$ ,  $S=0.57548$

*SD=Strongly Disagree, D=Disagree, N=Neutral A=Agree, SA= Strongly Agree*

Table 4.15 indicates the key operational mechanisms that should be put in place in order to overcome the barriers that hinder effective technology transfer in University-Industry partnerships. From the study, 32.2 % of participants recommended that training programmes and strong partnership should be employed, 26.1 % of participants suggested that there should improvement in skills in innovation and intellectual property right of the researchers. Besides, 10.6 % of the respondents opined that there should formulation of rigid rules against the barriers, 11.2 % of the respondents commended for provision of sufficient resources and 5.9 % of the participants observed that there should be a highly

organized interlink liaison office with research, production and extension divisions at the universities.

**Table 4. 15 Response frequencies for key operational mechanisms to overcome the barriers to effective technology transfer in University-Industry partnerships.**

Statement	Frequency	Percent
Training & strong partnership	121	32.2
Improve skills in innovation & intellectual property right	98	26.1
Avoidance of extreme rigid rules against the barriers	53	14.1
Sufficient resources	42	11.2
Setting up rigid rules against the barriers	40	10.6
Interlink liaison office with RPE divisions	22	5.9
Total	387	100.0

#### 4.4.4.2 Correlation results on Co-operation With Industry and Creation of University Spin-Off Firms/ Technology Transfer Process (CUSOF/TTP)

The study sought to examine the linear relationship between CWI and CUSOF/TTP. Table 4.16 shows that there is a significant positive correlation between CWI and CUSOF/TTP,  $r(387) = 0.520$ ,  $p\text{-value} < 0.001$  denoting that an intensification of CWI enhanced CUSOF/TTP. Therefore, an increase in use of CWI led to an increase in CUSOF/TTP.

**Table 4. 16 Correlation results on Co-operation With Industry and Creation of University Spin-Off Firms/ Technology Transfer Process (CUSOF/TTP)**

		CWI	CUSOF/TTP
CWI	Pearson Correlation	1	.520**
	Sig. (2-tailed)		.000
	N	387	387

\*\* . Correlation is significant at the 0.01 level (99% confidence level) (2-tailed).

#### 4.4.4.3 Regression results on Co-operation With Industry (CWI) and Creation of University Spin-Off Firms/ Technology Transfer Process (CUSOF/TTP)

The correlation results shown above it is evident that there is a positive relationship between CWI and CUSOF/TTP, a regression analysis was conducted to establish the

extent to which CWI influences CUSOF/TTP. A hypothesis to guide the research was as follows;

**Hypothesis H<sub>03</sub>:** *Co-operation With Industry has no significant influence on the creation of university spin-off firms in Kenya.*

To test the hypothesis, the model  $Y = \beta_0 + \beta_3 X_3 + \varepsilon$  that was significant ( $p < 0.01$ ) was fitted

**Where**  $Y$  - CUSOF/TTP

$\beta_0$  - Constant

$\beta_3$  - Coefficient, 3

$X_3$  - CWI

$\varepsilon$  - Error term

Table 4.17 presents model 3m with CWI as independent variable. The model shows that relationship between CWI and CUSOF/TTP is significant ( $F(1, 382) = 141.672, p < 0.001$ ) and  $R^2 = 0.271$  meaning that 27.1 % of CUSOF/TTP can be explained by CWI with the difference that is 72.9% described by other factors outside the model. Furthermore,  $\beta$  co-efficient for CWI was significant ( $\beta = 0.520, t = 11.903, p < 0.001$ ) meaning that that for every 1 unit increase in CWI there was an equivalent increase by 0.520 units in CUSOF/TTP.

Hence, the model equation for CWI was;

$$\text{Model 3m } Y = \beta_0 + \beta_3 X_3 + \varepsilon$$

$$\text{CUSOF/TTP} = 1.322 + 0.584 \text{CWI}$$

In conclusion, the results confirm that CWI has significant influence on the CUSOF/TTP and hence null hypothesis,  $H_{03}$  is therefore rejected.

**Table 4. 17 Regression results on Co-operation With Industry (CWI) and Creation of University Spin-Off Firms/ Technology Transfer Process (CUSOF/TTP)**

Model summary						
Model	R	R Square	Adjusted R Square		Std. Error of the Estimate	
3m	.520 <sup>a</sup>	.271	.269		.41973	
ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
3m	Regression	24.959	1	24.959	141.672	.000 <sup>a</sup>
	Residual	67.298	382	.176		
	Total	92.256	383			
Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
3m	(Constant)	1.322	.180		7.357	.000
	CWI	.584	.049	.520	11.903	.000

a. Predictors: (Constant), Cooperation With Industry (CWI)  
b. Dependent Variable: Creation of university Spin-Off Firms/Technology Transfer process

**4.4.4.4 Discussion of findings on the relationship between Cooperation With the Industry (CWI) and the Creation of University Spin-off Firms (CUSOF/TTP).**

Co-operation With Industry (CWI) was measured by *financial*; additional financial sources, state grants, *technological*; access to teams and materials, access to experience of employees, *strategic*; access to strategic resources, Improving image/prestige/reputation, Citations, publications, Doctoral dissertations, conferences, *Educational*; Training in the firm, Mobility of firm staff, *Political*; Adaptation on a 5-point likert scale with 1= ‘Strongly Disagree’ and 5= ‘Strongly Agree’. In summary, the 23 items in Tables 4.13 and 4.14 explaining the co-operation with industry (CWI) were

aggregated to get  $X_3$  score for each respondent that is 3.6368. With the means ranging between 3.68 and 4.15 and the standard deviations between 0.703 and 1.048, the results indicate that a majority of the academics agreed with the statements and were employing various collaborations with industry players to enhance their ability to create spin-off firms. Furthermore, descriptive results suggested that the mean scores for the sub-scales were: financial ( $\bar{x}=4.0$ ,  $S =0.801$ ); technological ( $\bar{x}=4.15$ ,  $S =0.717$ ); strategic ( $\bar{x}=3.98$ ,  $S =0.851$ ); educational ( $\bar{x}=3.78$ ,  $S =0.981$ ) and political ( $\bar{x}=3.97$ ,  $S =0.859$ ). The study showed that the academic observed themselves to have above average cooperation with industry, with technology being the most important aspect of co-operation.

Table 4.17, statistically shows that there is a significant positive correlation between CWI and CUSOF/TTP ( $r(387) =0.520$ ,  $p\text{-value} < 0.001$ ) explaining that an intensification of CWI enhanced CUSOF/TTP. The mathematical model shows that there is a significant relationship between CWI and CUSOF/TTP ( $F(1, 382) =141.672$ ,  $p < 0.001$ ) and  $R^2=0.271$  meaning that 27.1 % of CUSOF/TTP can be explained by CWI with the difference that is 72.9% described by other factors outside the model. Furthermore,  $\beta$  co-efficient for CWI was significant ( $\beta =0.520$ ,  $t=11.903$   $p < 0.001$ ) meaning that that for every 1 unit increase in CWI there was an equivalent increase by 0.520 units in CUSOF/TTP. The findings are supported by Dooley and Kirk (2007) who posited that in order for university and industry to establish and sustain collaboration, they must gain mutual benefit from the interactions. The channels of university-industry interaction can broadly be defined into four categories: (1) research support; (2) technology transfer; (3)



knowledge transfer; and (4) cooperative research. Leydesdorff & Etzkowitz (1998) refer to the latter of these as “the fourth phase of academy-industry relations”, where relations deepen and there is a shift from sponsorship to partnership. This form of collaborative research involves a deepening of relations and offers greater scope for mutual benefits. These collaborations are distinguished by greater depth of relationships between the partners and a longer-term focus regarding the interaction. This result are in contrast with Blumenthal et al.(1996) who reported that 90 percent of life-science companies in the United States had some relationship with academia. In Kenya less than ten percent of the companies are in collaboration with the industry which leave huge deficit in term of appropriate technology transfer. The most prevalent type of relationship involved the use of university faculty members as consultants (88 percent). More than half of life-science companies (59 percent) supported university research, and 38 percent participated in training by supporting the education of students and fellows through grants, fellowships, or scholarships (Blumenthal et al., 1996).

### **Data Standardisation**

Before running the regression models, data standardisation was performed by addressing multicollinearity that could lead high inter-correlations or inter-associations among the independent variables compromise the statistical inferences made about the data. To obtain the interaction term, the data was transformed to meet the assumption of statistical interpretations and while on the other hand, data centering was done for each variable by subtracting its mean from each value.

#### **4.4.5 Academic entrepreneurial intentions and creation of university spin-off firms in Kenya.**

**Specific objective 4:** *To find out the influence of joint academic entrepreneurial intentions on the creation of university spin-off firms in Kenya.*

The research set to found out how academic entrepreneurial intentions (AEI) influences the creation of university spin-off (CUSOF/TTP) firms in Kenya. AEI was measured using constructs but placed on a 5-Point Likert scale, where 1 represented ‘Strongly Disagree (SD)’ and 5 represented ‘Strongly Agree (SA).

##### **4.4.5.1 Descriptive Analysis on Academic Entrepreneurial Intentions (AEI)**

The study sought to know the respondents level of agreement on various statements relating to academic entrepreneurial intentions on creation of university spin-off firms. Using a 5-Point Likert scale, the research findings in Table 4.18 indicated that 78.3 % (M=3.88, SD=1.126) of the respondents agreed that their professional goal was to become entrepreneurs. When the participants were asked to state whether they have put in place every effort to start and run my own firm, 60.5 % (M=3.49, SD=1.125) of them agreed that they are working on a plan to launch their own spin-off firms.

Interestingly, the study pointed out that 75.1% (M=3.92, SD=1.172) of the respondents posited that they don’t have the well-grounded intention to start a business someday despite their earlier observations that their professional goal is to become an entrepreneur. From the findings, 81.4 % (M=4.08, SD=1.046) agreed that being an entrepreneur would entail great satisfactions for them, however 59.5% (M=3.46, SD=1.070) had refined or improved the business idea. The research findings showed that 68.2% (M=3.65,

SD=1.091) of the respondents can control the creation process of a new firm. 78.2 % (M=4.04, SD=1.106) of the respondents argued that in case they started firm, they had low probability of succeeding. Similarly, 84.2% (M=4.03, SD=.0971) of the respondents indicated that in the event they identified opportunities for commercial application of their inventions, they would consider becoming entrepreneurs in order to commercialize it. 58.4% (M=3.42, SD=1.200) of the respondents revealed that they have not developed their business goals and objectives, organization structure, strategic plan. Consequently, 45.8 % (M=3.04, SD=1.199) of the respondents agreed that had searched for financing in readiness for starting the business whereas 49.6% (M=3.22, SD=1.320) of the respondents posited that they have not gathered appropriate information on customers and competitors in this particular industry.

In summary, after achieving a Cronbach threshold of 0.851 (see Appendix 2), the 11 items in Table 4.18 explaining academic entrepreneurial intentions (AEI) and Creation of Spin-Off Firms (CUSOF/TTP) were aggregated to get  $Y_0$  score for each respondent (  $\bar{x}=3.64842, S=0.56832$ ). With the means ranging between 2.85 and 3.82 and the standard deviations between 0.836 and 1.238, the results indicate that majority of academics wanted to embrace being entrepreneurship as avenue to self- employment.

**Table 4. 18 Response frequencies for Academic Entrepreneurial Intentions.**

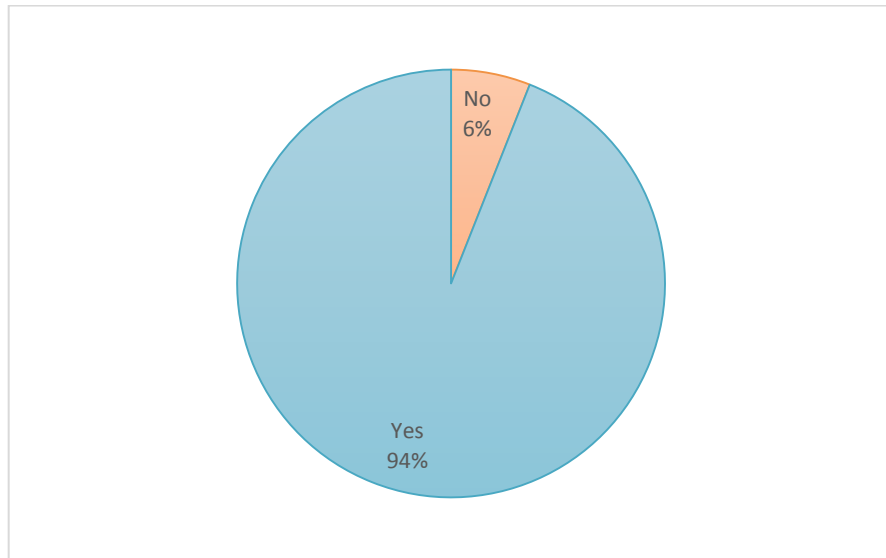
Statement	SD	D	N	A	SA	Mean	Std. Deviation
	%	%	%	%	%		
My Professional goal is to become an entrepreneur.	5.4	10.6	5.7	47.3	31.0	3.88	1.126
I have put in place every effort to start and run my own firm.	4.7	19.5	15.3	43.3	17.1	3.49	1.125
Don't have the well-grounded intention to start a business someday.	4.1	13.5	7.3	36.0	39.1	3.92	1.172
Being an entrepreneur would entail great satisfactions for me.	3.9	6.3	8.4	40.7	40.7	4.08	1.046
Have refined or improved the business idea.	4.2	18.8	17.5	46.2	13.3	3.46	1.070
I can control the creation process of a new firm.	5.0	13.0	13.8	48.3	19.9	3.65	1.091
If I tried to start a firm, I would have a low probability of succeeding.	3.1	10.9	7.8	35.2	43.0	4.04	1.106
In case, I identified possibilities for a commercial application of my inventions, I would consider becoming an entrepreneur to commercialize the opportunity.	3.4	6.5	6.0	52.5	31.7	4.03	.971
I have not developed my business goals and objectives, organization structure, strategic plan.	6.0	22.9	12.8	39.6	18.8	3.42	1.200
I have searched for financing.	9.0	33.0	12.2	36.2	9.6	3.04	1.199
I have not gathered information on customers, competitors in the industry.	8.8	30.6	10.9	28.6	21.0	3.22	1.320

$n=387, \bar{x}=3.64842, S=0.56832$

*SD=Strongly Disagree, D=Disagree, N=Neutral A=Agree, SA= Strongly Agree*

### **In the event, you have an opportunity and resources, would you invest in a start-up business?**

The respondents were asked to state whether in an event they had viable opportunity and resources they will consider investing in a start business, the results in Figure 4.6 indicated that 94% said yes while 6% said No.



**Figure 4. 6 Investing in a startup business**

Table 4.19 presents the reasons behind the responses in Fig 4.6. The study found out that 29.4 % of respondents indicated that the need to get a regular source of income would compel them to be entrepreneurial. 19.4% respondents indicated that availability of resources and finances will be a primary determining factor. 15.0% of the respondents argued that they would invest in business for main objectives of utilizing resources, savings and creating opportunities while on the other hand 11.5 % would do that because they wanted to create job opportunities. Lastly, other factors like; to gain experience in their career, to acquire inadequate skills, to strengthen their profession were less than 10%.

**Table 4. 19 Reasons for investing in a start-up business**

<b>Statement</b>	<b>Frequency</b>	<b>Percent</b>
Source of income	112	29.4
Given resources and finances i would start	74	19.4
Utilize resources, savings and creating opportunities	57	15.0
To create job opportunities	44	11.5
As part of my profession	30	7.9
Gain experience in my career	27	7.1
Not yet planned	25	6.6
Inadequate skills	12	3.1
<b>Total</b>	<b>387</b>	<b>100.0</b>

**4.4.5.2 Correlation results on Academic Entrepreneurial Intentions (AEI) and Creation of University Spin-Off Firms/ Technology Transfer Process (CUSOF/TTP)**

The study sought to examine the linear relationship between AEI and CUSOF/TTP. Table 4.20 shows that there is a significant positive correlation between AEI and CUSOF/TTP,  $r(387) = 0.307$ ,  $p\text{-value} < 0.001$  explaining that developing and maintaining of AEI improved CUSOF/TTP. Therefore, an increase in use of AIE led to an increase in CUSOF/TTP.

**Table 4. 20 Correlation results on Academic Entrepreneurial Intentions (AEI) and Creation of University Spin-Off Firms/ Technology Transfer Process (CUSOF/TTP)**

		AEI	CUSOF/TTP
AEI	Pearson Correlation	1	.307**
	Sig. (2-tailed)		.000
	N	387	387

\*\* . Correlation is significant at the 0.01 level (99% confidence level) (2-tailed).

**4.4.5.3 Regression results on the combined Academic Entrepreneurial Intentions (AEI) ESE, PPN and CWI and CUSOF/TTP**

In the study, multiple regression analysis was employed in order to find out whether independent variables; ESE, PPN and CWI all at once have influence on the dependent variable; CUSOF/TTP) A hypothesis to guide the research was as follows;

**Hypothesis H<sub>04</sub>:** *Joint academic entrepreneurial intentions has no significant influence on the creation of university spin-off firms in Kenya.*

To test the hypothesis, the model  $4_m \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$  that was significant ( $p < 0.01$ ) was fitted

**Where**  $Y$  - CUSOF/TTP

$\beta_0$  - Constant

$\beta_1$  - Co-efficient 1,

$\beta_2$  - Coefficient 2,

$\beta_3$  - Coefficient 3

$X_1$  - ESE

$X_2$  - PPN

$X_3$  - CWI

$\varepsilon$  - Error term

Table 4.21 presents model 4<sub>m</sub> with ESE, PPN and CWI as independent variables. The model shows that relationship between combined ESE, PPN and CWI and CUSOF/TTP is significant (F (3, 379) =84.665, p<0.001) and R<sup>2</sup>=0.401 meaning that 40.1 % of CUSOF/TTP can be explained by AEI with the difference that is. 59.9% described by other factors outside the model. In addition,  $\beta$  co-efficients for ESE, PPN and CWI were significant ( $\beta$  =0.113, t=2.523;  $\beta$  =0.377, t=7.654;  $\beta$  =0.276, t=5.794 p<0.001) respectively.

Hence, the model equation for AEI was;

Hence, the model equation for combined AIE (ESE, PPN and CWI) was;

$$\text{Model } 4_m Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

$$\text{CUSOF/TTP} = 0.839 + 0.105\text{ESE} + 0.312\text{PPN} + 0.309\text{CWI}$$

In conclusion, the results confirm that AEI has significant influence on the CUSOF/TTP and hence null hypothesis,  $H_{04}$  is therefore rejected.

**Table 4. 21 Regression results on the combined ESE, PPN and CWI and CUSOF/TTP**

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
4m	.633 <sup>a</sup>	.401	.397	.37927		
ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
4m	Regression	36.535	3	12.178	84.665	.000 <sup>a</sup>
	Residual	54.516	379	.144		
	Total	91.051	382			
Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
4m	(Constant)	.839	.184		4.568	.000
	Entrepreneurial Self-Efficiency (ESE)	.105	.041	.113	2.523	.012
	Personal and Professional Networks (PPN)	.312	.041	.377	7.654	.000
	Cooperation With Industry(CWI)	.309	.053	.276	5.794	.000

a) Predictors: (Constant), Cooperation With Industry (CWI), Entrepreneurial Self-Efficiency (ESE), Personal and Professional Networks (PPN)  
b) Dependent Variable: Creation of University Spin-Off Firms/Technology Transfer process (CUSOF/TTP)

$n=387, \bar{x}=3.44868, S=0.48969$

$SD=Strongly Disagree, D=Disagree, N=Neutral A=Agree, SA= Strongly Agree$

#### **4.4.5.4 Discussion on the combined Academic Entrepreneurial Intentions (AEI) and Creation of Spin-off firms in Kenya (CUSOF/TTP)**

The summary of the descriptive statistics shows that the 11 items in Table 4.18 explaining the academic entrepreneurial intentions (AEI) and Creation of Spin-Off Firms (CUSOF/TTP) were aggregated to get  $Y_0$  score for each respondent ( $\bar{x}=3.64842, S=0.56832$ ). With the means ranging between 2.85 and 3.82 and the standard deviations between 0.836 and 1.238, the results indicate that majority of academics wanted to embrace entrepreneurship as avenue to self-employment. On the other hand, inferential statistics shows that there is a significant positive correlation between AEI and CUSOF/TTP,  $r(387) = 0.307, p\text{-value} < 0.001$  explaining that developing and



maintaining of AEI improved CUSOF/TTP. Therefore, an increase in use of AIE led to an increase in CUSOF/TTP. The statistical model shows that the relationship between combined ESE, PPN and CWI and CUSOF/TTP is significant ( $F(3, 379) = 84.665$ ,  $p < 0.001$ ) and  $R^2 = 0.401$  meaning that 40.1 % of CUSOF/TTP can be explained by AEI with the difference that is 59.9% described by other factors outside the model. In addition,  $\beta$  co-efficients for ESE, PPN and CWI were significant ( $\beta = 0.113$ ,  $t = 2.523$ ;  $\beta = 0.377$ ,  $t = 7.654$ ;  $\beta = 0.276$ ,  $t = 5.794$   $p < 0.001$ ) respectively.

This research points out that personal and environmental factors influence the creation of spin-off firms which corroborate with other researches that used the theory of planned behavior to explain entrepreneurial intention (Ajzen, 2005; Ajzen & Fishbein, 1980; Ayuo & Kubasu, 2014; Krueger & Carsrud, 1993). The theory indicates that attitude, social norm, and controlled behavior predict intention of an action. Earlier studies of entrepreneurial intention applying the theory of planned behavior have explored these three determinants. For instance, from the aspect of attitude, researchers have examined how individual attitude influences IT professionals' intention to start a business (Lee, Wong, Der Foo, & Leung, 2011)

From the aspect of social norm, researchers have analyzed the impact of cultural values and gender difference on entrepreneurial intention (Díaz-García & Jiménez-Moreno, 2010; Shinnar, Giacomini, & Janssen, 2012; Siu & Lo, 2013). From the aspect of controlled behavior, researchers have explored self-efficacy that measures the perceived entrepreneurial skill and examined its effect on entrepreneurial intention (Chen et al., 1998; Zhao et al., 2005). However, it is important to notice a variation in the actual

application of the theory: the three determinants have been examined simultaneously or separately across studies. That is, given a specific context, researchers have selectively used different determinants to build their corresponding models (Florida & Cohen, 1999; Shinnar et al., 2012; Siu & Lo, 2013).

In addition, Ayuo and Kubasu (2014) relates personality traits and entrepreneurial intention. The duo state that the commonly mentioned personality traits of AIE are: need for achievement; locus of control, and risk taking propensity. As to risk propensity, the findings differ with most empirical studies that entrepreneurs of small firms do not have favorable attitudes related to risk, nor are they considered as risk takers. Furthermore, the researchers compare contextual actors and AEI and observe that the decision to become an entrepreneur is based on other factors other than just personal characteristics and psychological traits. Hence, the contextual factors that are the environmental elements that might have an influence on EI. These factors include aspects such as: administrative complexities, accessibility to resources, physical and institutional infrastructure, economic, political and cultural climate(Ayuo & Kubasu, 2014).

In summary, Table 4.22 show that all the three hypotheses,  $H_{01}$ ,  $H_{02}$ ,  $H_{03}$  that were tested in the study were all rejected,  $p < 0.001$ . Hence for the three independent variables; entrepreneurial self-efficacy, personal and professional networks and co-operation with industry had significant influence on the creation of spin-off firms in Kenya.

**Table 4. 22 Summary of results of Hypotheses Tested**

No	Variable	P-value	Direction	Deduction
H <sub>01</sub>	Entrepreneurial Self Efficacy	<0.001	Positive	Reject H <sub>01</sub>
H <sub>02</sub>	Personal and Professional Networks	<0.001	Positive	Reject H <sub>02</sub>
H <sub>03</sub>	Co-operation With Industry	<0.001	Positive	Reject H <sub>03</sub>

**4.4.6 Moderating effect of Opportunity Identification and Recognition on the regression of Academic Entrepreneurial Intentions and the Creation of University Spin-off Firms in Kenya.**

**Specific objective 5:** To establish the influence of moderating effect of opportunity identification and recognition on the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya

The study sought to investigate how Opportunity Identification and Recognition (OIR) moderates the relationship between Academic Entrepreneurial Intentions (AEI) and the creation of university spin-off firms (CUSOF/TTP) in Kenya. The OIR was measured using statements developed from 5-stage process; getting the idea/scanning the environment, identifying the opportunity, developing the opportunity, evaluating the opportunity and evaluating the team but placed on a 5-Point Likert scale, where 1 represented ‘Strongly Disagree (SD)’ and 5 represented ‘Strongly Agree (SA).

**4.4.6.1 Descriptive Analysis on Opportunity Identification and Recognition (OIR)**

In Table 4.23, the findings showed that 78.9% (M=3.99, SD=1.014) of the respondents indicated that they were not resilient enough to overcome life’s struggles whereas 78.3% (M=3.84, SD=1.014) of the respondents observed that they often felt optimistic in their entrepreneurial discoveries. 53.4%(M=3.34, SD=1.300) of the respondents opined that

they struggle to discover opportunities where others see creativity. In the study, the findings showed that 92.6% (M=4.21, SD=0.731) of the respondents had indicated that they had the ability to achieve specific business goals. In addition, 82.2 % (M=3.97, SD=0.881) observed that while going about their routine day-to-day activities, they saw potentially new venture ideas all around them. 80.1% (M=3.96, SD=0.839) of the respondents revealed that having prior knowledge of markets, ways to serve markets and customer problems had helped them to recognize certain opportunities. Furthermore, 83.6 % (M=4.01, SD=0.789) said that having prior knowledge in business also triggers the recognition of the value of the new information. 64 % (M=3.57, SD=1.164) of the respondents observed that their contacts or discussions with potential or existing customers have not helped them to recognize opportunities. Similarly, 81.5 % (M=3.93, S.D=0.853) of the respondents opined that their contacts or discussions with existing suppliers, distributors, or manufacturers has helped them to recognize opportunities, 87.4 % (M=4.13, SD=0.801) of the respondents agreed that their social and professional contacts has helped them to recognize opportunities.

In summary, after achieving a Cronbach threshold of 0.789 (see Appendix 2), the 11 items in Table 4.23 describing the process of opportunity identification and recognition (OIR) were aggregated to get  $Z_1$  score for each respondent  $\bar{x}=3.8928$ . With the means ranging between 3.34 and 4.21 and the standard deviations between 0.789 and 1.300, the results indicate that a majority of the academics agreed with the statements and were leveraging on their contacts, prior knowledge and environment to recognize opportunities.

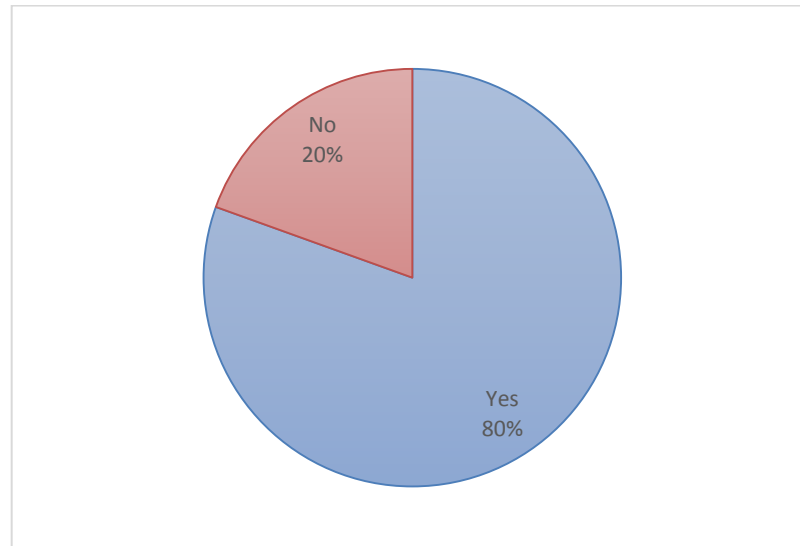
**Table 4. 23 Response frequencies for Opportunity Identification and Recognition**

	SD	D	N	A	SA	Mean	Std. Deviation
	%	%	%	%	%		
I am not resilient enough to overcome life's struggles.	2.4	9.5	9.2	44.7	34.2	3.99	1.014
I often feel optimistic in my entrepreneurial discoveries.	3.9	9.4	8.4	54.9	23.4	3.84	1.014
I struggle to discover opportunities where others see creativity.	8.4	25.4	12.8	30.9	22.5	3.34	1.300
I have the ability to achieve specific goals.	1.6	1.6	4.2	59.9	32.7	4.21	.731
While going about routine day-to-day activities, I see potential new venture ideas all around me	2.3	5.5	9.9	57.7	24.5	3.97	.881
Having prior knowledge of markets, ways to serve markets and customer problems has helped in recognizing certain opportunities.	1.0	6.0	12.9	56.2	23.9	3.96	.839
Having prior knowledge triggers recognition of the value of the new information.	0.5	5.7	10.2	59.3	24.3	4.01	.789
My contacts or discussions with potential or existing customers have not helped me to recognize opportunities.	5.8	16.4	13.8	42.6	21.4	3.57	1.164
My contacts or discussions with existing suppliers, distributors, or manufacturers help me to recognize opportunities.	1.8	6.1	10.6	59.9	21.6	3.93	.853
My social and professional contacts help me to recognize opportunities	0.8	4.8	7.0	55.4	32.0	4.13	.801

$n=387, \bar{x}=3.8928, S=0.54896$

$SD=Strongly\ Disagree, D=Disagree, N=Neutral, A=Agree, SA=Strongly\ Agree$

Figure 4.7 indicate that 80 % of the respondents agreed and 20% of the respondents disagreed to the question that there had a special “alertness” or sensitivity toward new venture opportunities in their immediate environment.



**Figure 4. 7 Special “alertness” or sensitivity towards new venture opportunities in your immediate environment**

Table 4.24 further explains the response to the Figure 4.7 above. From the research findings, 23.8% of respondents observed that they had special alertness to identifying their area of interest, 23.0 % of participants were sensitive towards trending ideas that were necessary for change, 17.8% of respondents were alert so as gather information from the environment and 14.8% of participants indicated that they need to identify a gap in market that is ready for provision of goods and services. Interestingly, 7.9% of respondents were completely not interested in venture opportunities with 8.7% of participants indicating that they had inadequate time.

**Table 4. 24 Explanation for special “alertness” or sensitivity toward new venture opportunities in your immediate environment**

Statement	Frequency	Percent
To identify my area of interest	87	23.8
Upcoming ideas are necessary for change	84	23.0
To gather information	65	17.8
To identify a gap in market	54	14.8
Not informed on time	32	8.7
Not interested in venture opportunities	29	7.9
Inadequate time	15	4.1
<b>Total</b>	<b>387</b>	<b>100.0</b>

**4.4.6.2 Correlation results on Opportunity Identification and Recognition (OIR) and Creation of University Spin-Off Firms/ Technology Transfer Process in Kenya (CUSOF/TTP)**

The study sought to establish the linear relationship between Opportunity Recognition and Identification (OIR) and Creation of University Spin-Off Firms/Technology Transfer Process (CUSOF/TTP). The Table 4.25 shows that there is positive a correlation between OIR and the CUSOF/TTP,  $r(387) = 0.321$ ,  $p\text{-value} < .001$ .

**Table 4. 25 Correlation results on Opportunity Identification and Recognition (OIR) and Creation of University Spin-Off Firms/ Technology Transfer Process in Kenya (CUSOF/TTP)**

		OIR	CUSOF/TTP
OIR	Pearson Correlation	1	.321**
	Sig. (2-tailed)		.000
	N	387	387

\*\* . Correlation is significant at the 0.01 level (99% confidence level) (2-tailed).

**4.4.6.3 Regression results on the moderating effect of Opportunity Identification and Recognition on the regression of Entrepreneurial Self–Efficacy on Creation of Spin-off Firms in Kenya**

Although the correlation results shown in Table 4.25 indicated that there is a positive relationship between OIR and CUSOF/TTP, a regression analysis was conducted to establish the extent of moderating effect of OIR on relationship between AEI and CUSOF/TTP. The variable, AEI had sub-hypotheses namely; H5<sub>a</sub>, H5<sub>b</sub> and H5<sub>c</sub> with the moderator being the predictor and also the interaction term. In H5<sub>d</sub>, the moderating effect of OIR on the joint relationship between AEI was examined using a moderated multiple regression model.

Thus;

A hypothesis to guide the research was as follows;

**Hypothesis H<sub>05</sub>:** Opportunity identification and recognition have no significant moderating effect on the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya.

*Hypothesis H<sub>05a</sub>:* Opportunity identification and recognition have no significant moderating effect on the relationship between entrepreneurial self-efficacy and the creation of university spin-off firms in Kenya.

*Hypothesis H<sub>05b</sub>:* Opportunity identification and recognition have no significant moderating effect on the relationship between personal and professional networks and the creation of university spin-off firms in Kenya.

*Hypothesis H<sub>05c</sub>:* Opportunity identification and recognition have no significant moderating effect on the relationship between co-operation with industry and the creation of university spin-off firms in Kenya.

*Hypothesis H<sub>05d</sub>:* Opportunity identification and recognition have no significant moderating effect on the relationship between joint academic entrepreneurial intentions and the creation of university spin-off firms in Kenya.

This section covers the following;



**Hypothesis H<sub>05a</sub>:** *Opportunity identification and recognition have no significant moderating effect on the relationship between entrepreneurial self-efficacy and the creation of university spin-off firms in Kenya.*

In order to test the moderating effect of OIR on the regression of ESE on CUSOF/TTP, three (3) regression models were considered whereby the variables were entered serially that is ESE (independent) was entered first, followed by OIR (moderator) as the predictor and finally the ESE\*OIR (interaction term). Remarkably, all the three models were significant ( $p < 0.001$  in all the three cases).

The following models were fitted;

$$\text{Model 5m}_1 \quad Y = \beta_0 + \beta_1 X_1 + \varepsilon$$

$$\text{Model 5m}_2 \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 Z_1 + \varepsilon$$

$$\text{Model 5m}_3 \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 Z_1 + \beta_3 X_1 Z_1 + \varepsilon$$

**Where**  $Y$  - CUSOF/TTP

$\beta_0$  - Constant

$\beta_1$  - Co-efficient 1,

$\beta_2$  - Coefficient 2,

$\beta_3$  - Coefficient 3,

$X_1$  - ESE,

$Z_1$  - OIR (predictor),

$\varepsilon$  - Error term

Table 4.26 presents Model 5m<sub>1</sub> with ESE as independent variable. The model shows that relationship between ESE and CUSOF/TTP is significant (F (1, 380) =57.218, p<0.001) and (ΔR<sup>2</sup>=0.131, ΔF=57.218, p<0.001). Furthermore, β co-efficient for ESE was significant (β =0.362, t=7.564, p<0.001).

Hence, the model equation for ESE was;

$$\text{Model 5m}_1 \quad Y = \beta_0 + \beta_1 X_1 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.447 + 0.336 \text{ESE}$$

Similarly, Model 5m<sub>2</sub> shows that the relationship between ESE (independent) and CUSOF/TTP with OIR (moderator) as the predictor was significant (F (2, 379) =31.043, p<0.001). The model shows that upon adding OIR the relationship is also significant (ΔR<sup>2</sup>=0.010, ΔF =4.363, p = 0.037) indicating OIR is a significant predictor between ESE and CUSOF/TTP. In addition, β co-efficient for OIR as a predictor was significant (β =0.137, t=2.089, p<0.001), meaning that 1 unit increase in OIR, increased CUSOF/TTP by about 0.137 units. The findings confirm that OIR is significant in the relationship between ESE and CUSOF/TTP.

Therefore, the model equation for ESE and OIR was;

$$\text{Model 5m}_2 \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 Z_1 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.447 + 0.249 \text{ESE} + 0.122 \text{OIR}$$

Furthermore, Model 5m<sub>3</sub> shows that the relationship between with ESE (independent) and CUSOF/TTP with OIR (moderator) as the predictor when ESE\*OIR (interaction term) was added is significant (F (3, 378) =26.272, p<0.001). In addition, the results shows that upon adding the interaction term to model, the R<sup>2</sup> and F changes were

significant respectively ( $\Delta R^2=0.032$ ,  $\Delta F =14.517$ ,  $p < 0.001$ ).  $\beta$ , co-efficient for ESE\*OIR as a predictor was significant, ( $\beta =0.195$ ,  $t=3.810$ ,  $p<0.001$ ), meaning that 1 unit increase in OIR index led to 0.195 units increase in CUSOF/TTP giving it a substantial predictive value to the regression model. This imply that OIR significantly moderates the relationship between ESE and CUSOF/TTP.

The model equation for ESE, OIR and ESE\*OIR was:

$$\text{Model 5m}_3 \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 Z_1 + \beta_3 X_1 Z_1 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.403 + 0.265\text{ESE} + 0.182\text{OIR} + 0.223\text{ESE*OIR}$$

In conclusion, the findings confirm that OIR is significant in the relationship between ESE and CUSOF/TTP and hence null hypothesis,  $H_{05a}$  is therefore rejected.

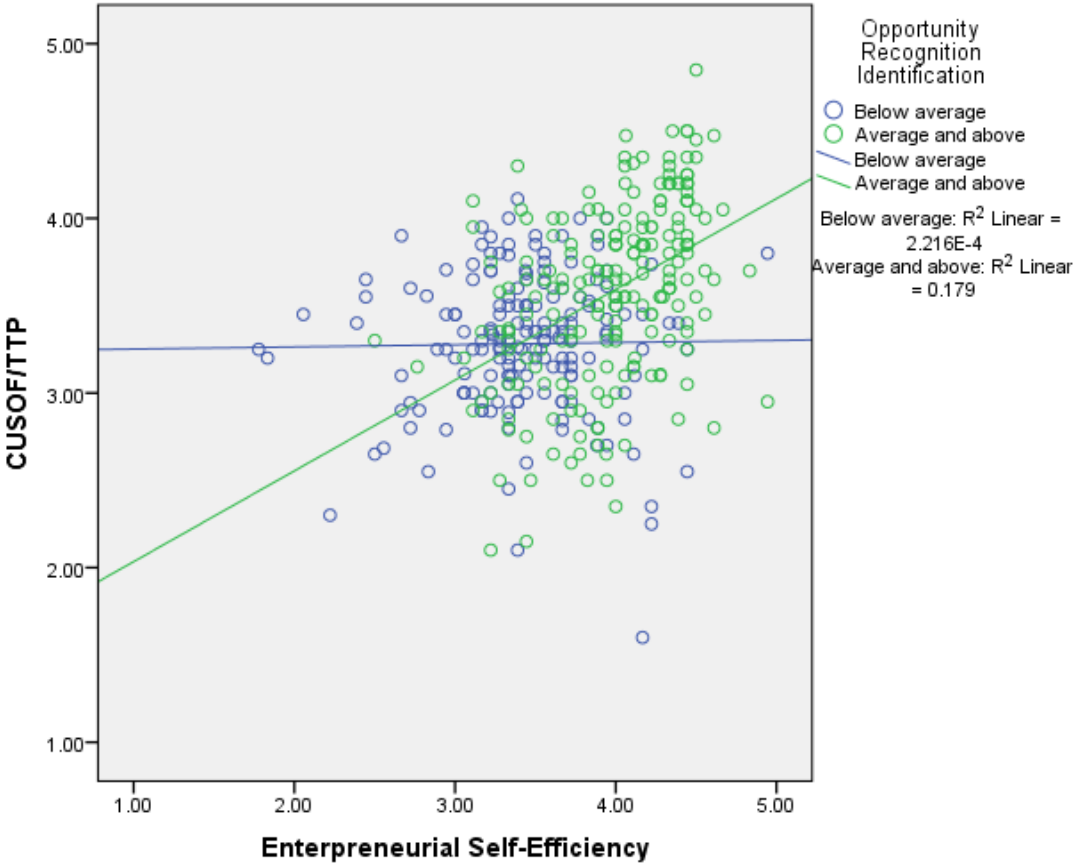
**Table 4. 26 Regression results on the moderating effect of Opportunity Identification and Recognition (OIR) on regression of Entrepreneurial Self-Efficacy (ESE) on Creation of Spin-off Firms (CUSOF/TTP)**

Model Summary										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change in R Square	F Change	df1	df2	Sig.	F Change
5m <sub>1</sub>	.362 <sup>a</sup>	.131	.129	.45690	.131	57.218	1	380	.000	
5m <sub>2</sub>	.375 <sup>b</sup>	.141	.136	.45489	.010	4.363	1	379	.037	
5m <sub>3</sub>	.415 <sup>c</sup>	.173	.166	.44699	.032	14.517	1	378	.000	
ANOVA										
Model		Sum of Squares	df	Mean Square	F	Sig.				
5m <sub>1</sub>	Regression	11.945	1	11.945	57.218	.000 <sup>a</sup>				
	Residual	79.327	380	.209						
	Total	91.272	381							
5m <sub>2</sub>	Regression	12.847	2	6.424	31.043	.000 <sup>b</sup>				
	Residual	78.424	379	.207						
	Total	91.272	381							
5m <sub>3</sub>	Regression	15.748	3	5.249	26.272	.000 <sup>c</sup>				
	Residual	75.524	378	.200						
	Total	91.272	381							
Co-efficients										
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics			
		B	Std. Error	Beta			Tolerance	VIF		
5m <sub>1</sub>	(Constant)	3.447	.023		147.437	.000				
	ESE	.336	.044	.362	7.564	.000	1.000	1.000		
5m <sub>2</sub>	(Constant)	3.447	.023		148.093	.000				
	ESE	.249	.061	.268	4.080	.000	.527	1.897		
	OIR	.122	.059	.137	2.089	.037	.527	1.897		
5m <sub>3</sub>	(Constant)	3.403	.026		132.780	.000				
	ESE	.265	.060	.285	4.405	.000	.525	1.906		
	OIR	.182	.060	.204	3.052	.002	.491	2.038		
	ESE*OIR	.223	.059	.195	3.810	.000	.834	1.199		

a. Predictors: (Constant), Entrepreneurial Self Efficacy (ESE)  
b. Predictors: (Constant), Entrepreneurial Self Efficacy (ESE), Opportunity Identification and Recognition (OIR)  
c. Predictors: (Constant), Entrepreneurial Self Efficacy (ESE), Opportunity Identification and Recognition (OIR), Entrepreneurial Self Efficacy\*Opportunity Identification and Recognition (ESE\*OIR)  
d. Dependent Variable: Creation of university Spin-Off Firms/Technology Transfer process (CUSOF/TTP)

Figure 4.8 clearly shows the interaction between OIR as the moderating variable in the relationship between ESE and CUSOF/TTP in Kenya. The findings indicate that with minimal ESE, academics with below average OIR have a higher university spin-off firm's capacity than those with above average OIR. However the rate of increase of spin-off

potential is higher for those with above average OIR as ESE increases. This findings from the moderated regression analysis also show that OIR has a significant moderating effect on the ESE with CUSOF/TTP.



**Figure 4. 8 Moderating effect of opportunity identification and recognition on regression of entrepreneurial self–efficacy on creation of spin-off firms in Kenya.**

**Discussion of findings on the moderating effect of Opportunity Identification and Recognition (OIR) on regression of Entrepreneurial Self Efficacy (ESE) on the Creation of Spin-off firms in Kenya (CUSOF/TTP).**

This section discusses the findings on objective five of the study which focusses on the moderating effect of OIR on the relationship between ESE and the CUSOF/TTP.

Opportunity identification and recognition was measured using 5-point likert scale with

1= ‘Strongly Disagree’ and 5= ‘Strongly Agree’ statements derived from five main stages of opportunity identification and recognition namely; getting the idea/scanning the environment, identifying the opportunity, developing the opportunity, evaluating the opportunity and evaluating the team. The descriptive analysis showed that the 11 items in Table 4.23 describe the process of opportunity identification and recognition (OIR) were aggregated to get  $Z_1$  score for each respondent ( $\bar{x}=3.8928, S=0.54896$ ). With the means ranging between 3.34 and 4.21 and the standard deviations between 0.789 and 1.300, the results indicate that a majority of the academics agreed with the statements and were leveraging on their contacts, prior knowledge and environment to recognize opportunities. The inferential statistics showed that there is positive correlation between OIR and the CUSOF/TTP ( $r(387)=0.321, p\text{-value} < .001$ ). In addition, the model shows that the relationship between ESE (independent) and CUSOF/TTP with OIR (moderator) as the predictor was significant ( $F(2, 379)=31.043, p < 0.001$ ). Notably, upon adding OIR to the model the relationship was still significant ( $\Delta R^2=0.010, \Delta F=4.363, p=0.037$ ), ( $\beta=0.137, t=2.089, p < 0.001$ ). Further empirical findings showed that the relationship between with ESE (independent) and CUSOF/TTP with OIR (moderator) as the predictor when ESE\*OIR (interaction term) was added is significant ( $F(3, 378)=26.272, p < 0.001$ ). The results indicated that upon adding the interaction term to model, the  $R^2$  and F changes were significant respectively ( $\Delta R^2=0.032, \Delta F=14.517, p < 0.001$ ).  $\beta$ , co-efficient for ESE\*OIR as a predictor was significant, ( $\beta=0.195, t=3.810, p < 0.001$ ), meaning that 1 unit increase in OIR index led to 0.195 units increase in CUSOF/TTP giving it a substantial predictive value to the regression model. This imply

that OIR significantly moderates the relationship between ESE and CUSOF/TTP.

#### **4.4.6.4 Regression results on the moderating effect of Opportunity Identification and Recognition (OIR) on regression of Personal and Professional Networks and Creation of Spin-off Firms in Kenya.**

This section presents;

*Hypothesis H<sub>05b</sub>: Opportunity identification and recognition have no significant moderating effect on the relationship between personal and professional networks and the creation of university spin-off firms in Kenya.*

In order to test the moderating effect of OIR on regression of PPN on CUSOF/TTP, three (3) regression models were examined whereby the variables were entered sequentially that is PPN (independent) was entered first, followed by OIR (moderator) as the predictor and finally the PPN\*OIR (interaction term). Notably, the three models were significant ( $p < 0.001$  in all the three cases).

The models were fitted;

$$\text{Model 5m}_4 \quad Y = \beta_0 + \beta_1 X_2 + \varepsilon$$

$$\text{Model 5m}_5 \quad Y = \beta_0 + \beta_1 X_2 + \beta_2 Z_1 + \varepsilon$$

$$\text{Model 5m}_6 \quad Y = \beta_0 + \beta_1 X_2 + \beta_2 Z_1 + \beta_3 X_2 Z_1 + \varepsilon$$

**Where**  $Y$  - CUSOF/TTP

$\beta_0$  - Constant

$\beta_1$  - Co-efficient 1,

$\beta_2$  - Coefficient 2,

$\beta_3$  - Coefficient 3

$X_2$  - PPN,

$Z_1$  - OIR (predictor),

$\varepsilon$  - Error term

Table 4.27 presents model 5m<sub>4</sub> with PPN as independent variable. The model shows that the relationship between PPN and CUSOF/TTP is significant (F (1, 379) =180.523, p<0.001) and ( $\Delta R^2=0.323$ ,  $\Delta F=180.523$ , p<0.001). In addition,  $\beta$  co-efficient for PPN was significant ( $\beta =0.568$ , t=13.436, p<0.001).

Hence, the model equation for PPN was;

$$\text{Model 5m}_4 \quad Y = \beta_0 + \beta_1 X_2 + \beta_2 Z_1 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.450 + 0.430\text{PPN} + 0.142\text{OIR}$$

Alike, model 5m<sub>5</sub> shows that the relationship between PPN (independent) and OIR (moderator) as the predictor was significant (F (2, 378) =99.913, p<0.001). The model indicate that upon adding OIR the relationship is also significant ( $\Delta R^2=0.023$ ,  $\Delta F =13.398$ , p<0.001) indicating OIR is a significant predictor between PPN and CUSOF/TTP. Correspondingly,  $\beta$  co-efficient for OIR as a predictor was significant ( $\beta =0.160$ , t=3.660, p<0.001), meaning that 1 unit increase in OIR, increased CUSOF/TTP by about 0.160 units. The findings confirm that OIR is significant in the relationship between PPN and CUSOF/TTP.

Therefore, the model equation for PPN and OIR was;

$$\text{Model 5m}_5 \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 Z_1 + \varepsilon$$



$$\text{CUSOF/TTP}=3.447+0.249\text{ESE}+0.122\text{OIR}$$

Besides, model 5m<sub>6</sub> shows that the relationship between with PPN (independent), OIR (moderator) as the predictor when PPN\*OIR (interaction term) was added is significant (F (3, 377) =75.070, p<0.001). When the interaction term to model was added to the model, the results show that changes in R<sup>2</sup> and F were significant (ΔR<sup>2</sup>=0.028, ΔF =16.962, p < 0.001). The β, co-efficient for OIR as a predictor was significant, (β =0.169, t=4.117, p<0.001), meaning that 1 unit increase in OIR index led to 0.169 units increase in CUSOF/TTP giving it a sizeable predictive value to the regression model. This implies that OIR significantly moderates the relationship between PPN and CUSOF/TTP.

The model equation for PPN, OIR and ESE\*OIR was:

$$\text{Model 5m}_6 \quad Y = \beta_0 + \beta_1 X_2 + \beta_2 Z_1 + \beta_3 X_2 Z_1 + \varepsilon$$

$$\text{CUSOF/TTP}=3.425+0.410\text{PPN}+0.144\text{OIR}+0.256\text{PPN*OIR}$$

In summary, the findings confirm that OIR is significant in the relationship between PPN and CUSOF/TTP and hence null hypothesis, H<sub>05b</sub> is therefore rejected.

**Table 4. 27 Regression results on the moderating effect of Opportunity Identification and Recognition (OIR) on the regression of Personal and Professional Networks (PPN) on Creation of University Spin-off Firms in Kenya (CUSOF/TTP)**

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change in R Square	F Change	df 1	df 2	Sig. F Change
5m <sub>4</sub>	.568 <sup>a</sup>	.323	.321	.40121	.323	180.523	1	37	.000
5m <sub>5</sub>	.588 <sup>b</sup>	.346	.342	.39481	.023	13.398	1	37	.000
5m <sub>6</sub>	.612 <sup>c</sup>	.374	.369	.38673	.028	16.952	1	37	.000

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
5m <sub>4</sub>	Regression	29.059	1	29.059	180.523	.000 <sup>a</sup>
	Residual	61.008	379	.161		
	Total	90.067	380			
5m <sub>5</sub>	Regression	31.147	2	15.574	99.913	.000 <sup>b</sup>
	Residual	58.919	378	.156		
	Total	90.067	380			
5m <sub>6</sub>	Regression	33.683	3	11.228	75.070	.000 <sup>c</sup>
	Residual	56.384	377	.150		
	Total	90.067	380			

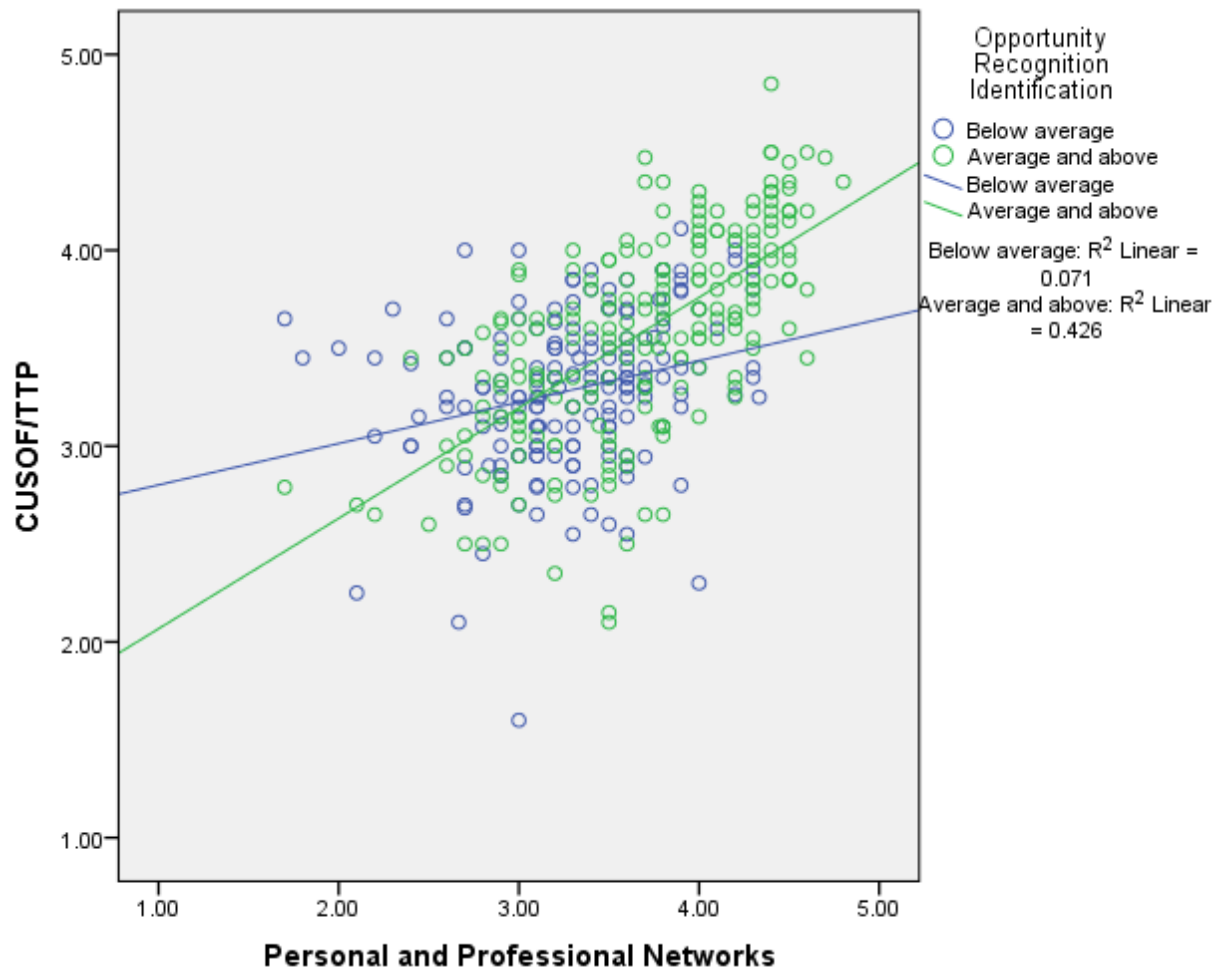
Coefficients							
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics
		B	Std. Error	Beta			Tolerance VIF
5m <sub>4</sub>	(Constant)	3.450	.021		167.838	.000	
	PPN	.471	.035	.568	13.436	.000	1.000 1.000
5m <sub>5</sub>	(Constant)	3.450	.020		170.564	.000	
	PPN	.430	.036	.519	11.874	.000	.906 1.104
	OIR	.142	.039	.160	3.660	.000	.906 1.104
5m <sub>6</sub>	(Constant)	3.425	.021		165.151	.000	
	PPN	.410	.036	.495	11.442	.000	.889 1.125
	OIR	.144	.038	.162	3.788	.000	.906 1.104
	PPN*OIR	.256	.062	.169	4.117	.000	.980 1.020

a. Predictors: (Constant), Personal and Professional Networks (PPN)

b. Predictors: (Constant), Personal and Professional Networks (PPN), Opportunity Identification and Recognition (OIR)

- 
- c. Predictors: (Constant), Personal and Professional Networks (PPN), Opportunity Identification and Recognition (OIR), Personal and Professional Networks\*Opportunity Identification and Recognition (PPN\*OIR)
  - d. Dependent Variable: Creation of university Spin-Off Firms/Technology Transfer process (CUSOF/TTP)
- 

Figure 4.9 clearly shows the interaction between OIR as the moderating variable in the relationship between PPN and CUSOF/TTP in Kenya. The findings indicate that just like with ESE, academics with below average OIR and have minimal PPN have a higher university spin-off firm's propensity than those with above average OIR. However, academics with above average OIR and minimal PPN starts at a lower rate of spin-off but gradually grows with intensification of PPN and surpasses the below average OIR academics. The deductions were that although both the groups' growth rate for CUSOF/TTP were directly proportional with PPN, below average OIR team felt more confident to start new venture than above average OIR team but slowed down with the later confidence emboldened with more collaborations and associations. This findings from the moderated regression analysis also show that OIR has a significant moderating effect on the PPN with CUSOF/TTP.



**Figure 4. 9 Moderating effect of personal and professional networks on regression of entrepreneurial self-efficacy on creation of spin-off firms in Kenya.**

**Discussion of findings on the moderating effect of Opportunity Identification and Recognition (OIR) on regression of Personal and Professional Networks (PPN) and Creation of Spin-off Firms in Kenya (CUSOF/TTP).**

Despite the fact that the null hypothesis stated that opportunity identification and recognition (OIR) has no significant moderating effect on the relationship between personal and professional networks (PPN) and the creation of university spin-off firms in Kenya (CUSOF/TTP), the empirical findings rejected that and confirmed that the

relationship between PPN (independent) and CUSOF/TTP with OIR (moderator) as the predictor was significant ( $F(2, 378) = 99.913, p < 0.001$ ).

Remarkably, upon adding OIR to the model the relationship was still significant ( $\Delta R^2 = 0.023, \Delta F = 13.398, p < 0.001$ ), ( $\beta = 0.160, t = 3.660, p < 0.001$ ). Further empirical findings showed that the relationship between with PPN (independent) and CUSOF/TTP with OIR (moderator) as the predictor when PPN\*OIR (interaction term) was added is significant ( $F(3, 377) = 75.070, p < 0.001$ ). The results indicated that upon adding the interaction term to model, the  $R^2$  and  $F$  changes were significant respectively ( $\Delta R^2 = 0.028, \Delta F = 16.952, p < 0.001$ ).  $\beta$ , co-efficient for PPN\*OIR as a predictor was significant, ( $\beta = 0.169, t = 4.117, p < 0.001$ ), meaning that 1 unit increase in OIR index led to 0.169 units increase in CUSOF/TTP giving it a considerable predictive value to the regression model. This imply that OIR significantly moderates the relationship between PPN and CUSOF/TTP.

#### **4.4.6.5 Regression results on the moderating effect of Opportunity Identification and Recognition on regression of Co-operation With Industry on the Creation of Spin-off Firms in Kenya.**

This section presents;

*Hypothesis H<sub>05c</sub>: Opportunity identification and recognition have no significant moderating effect on the relationship between*

*co-operation with industry and the creation of university  
spin-off firms in Kenya.*

In order to test the moderating effect of OIR on regression of CWI on CUSOF/TTP, three (3) regression models were studied where the variables were entered step by step that is CWI (independent) was entered first, followed by OIR (moderator) as the predictor and finally the CWI\*OIR (interaction term). Importantly, the three models were significant ( $p < 0.001$  in all the three cases).

The models were fitted;

$$\text{Model 5m}_7 \quad Y = \beta_0 + \beta_1 X_3 + \varepsilon$$

$$\text{Model 5m}_8 \quad Y = \beta_0 + \beta_1 X_3 + \beta_2 Z_1 + \varepsilon$$

$$\text{Model 5m}_9 \quad Y = \beta_0 + \beta_1 X_3 + \beta_2 Z_1 + \beta_3 X_3 Z_1 + \varepsilon$$

**Where**             $Y$  - CUSOF/TTP

$\beta_0$  - Constant

$\beta_1$  - Co-efficient 1,

$\beta_2$  - Coefficient 2,

$\beta_3$  - Coefficient 3

$X_3$  - CWI

$Z_1$  - OIR (predictor),

$\varepsilon$  - Error term

Table 4.28 presents model 5m<sub>7</sub>, CWI as the independent variable. The model shows that relationship between CWI and CUSOF/TTP is significant ( $F(1, 380) = 146.800$ ,

p<0.001), and ( $\Delta R^2=0.279$ ,  $\Delta F=146.800$ , <0.001). In addition,  $\beta$  co-efficient for CWI was also significant ( $\beta =0.528$ ,  $t=12.116$ ,  $p<0.001$ ).

Hence, the model equation for CWI was;

$$\text{Model 5m}_7 Y = \beta_0 + \beta_1 X_3 + \varepsilon$$

$$\text{CUSOF/TTP}=3.447+0.590\text{CWI}$$

Evidently, model 5m<sub>8</sub> shows that the relationship between CWI (independent) and OIR (moderator) as the predictor is significant ( $F(2, 379) =85.443$ ,  $p<0.001$ ). The empirical findings indicate that when OIR was added the relationship was still significant ( $\Delta R^2 = 0.032$ ,  $\Delta F =17.653$ ,  $p<0.001$ ) hence it was concluded that OIR is a significant predictor between CWI and CUSOF/TTP. Additionally,  $\beta$  co-efficient for OIR as a predictor was significant ( $\beta =0.187$ ,  $t=4.202$ ,  $p<0.001$ ), meaning that 1 unit increase in OIR, increased CUSOF/TTP by about 0.187 units. The findings confirm that OIR is significant in the relationship between CWI and CUSOF/TTP.

Therefore, the model equation for CWI and OIR was;

$$\text{Model 5m}_8 Y = \beta_0 + \beta_1 X_3 + \beta_2 Z_1 + \varepsilon$$

$$\text{CUSOF/TTP}=3.447+0.531\text{CWI}+0.167\text{OIR}$$

Moreover, Model 5m<sub>9</sub> shows that the relationship between with CWI (independent), OIR (moderator) as the predictor when CWI\*OIR (interaction term) was added is significant ( $F(3, 378) =61.171$ ,  $p<0.001$ ). Similarly, the results shows that when the interaction term was added to model, the changes in  $R^2$  and  $F$  were significant respectively ( $\Delta R=0.016$ ,  $\Delta F =9.014$ ,  $p < 0.001$ ). The  $\beta$ , co-efficient for OIR as a predictor was significant, ( $\beta$

=0.127, t=3.002, p=0.003), meaning that 1 unit increase in OIR index led to 0.127 units increase in CUSOF/TTP giving it a fair predictive value to the regression model. This imply that OIR significantly moderates the relationship between CWI and CUSOF/TTP.

The model equation for CWI, OIR and CWI\*OIR was:

$$\text{Model 5m}_9 \quad Y = \beta_0 + \beta_1 X_3 + \beta_2 Z_1 + \beta_3 X_3 Z_1 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.431 + 0.520\text{CWI} + 0.174\text{OIR} + 0.236\text{CWI*OIR}$$

In conclusion, the findings confirm that OIR is significant in the relationship between CWI and CUSOF/TTP and hence null hypothesis,  $H_{05c}$  is therefore rejected.

**Table 4. 28 Regression results on the moderating effect of Opportunity Identification and Recognition (OIR) on the relationship between Co-operation With Industry(CWI) and Creation of Spin-off Firms (CUSOF/TTP)**

<b>Model Summary</b>									
Model	R	R Squared	Adjusted R Square	Std. Error of the Estimate	Change of R Square	F Change	df1	df2	Sig. F Change
5m <sub>7</sub>	.528 <sup>a</sup>	.279	.277	.41624	.279	146.800	1	380	.000
5m <sub>8</sub>	.557 <sup>b</sup>	.311	.307	.40741	.032	17.653	1	379	.000
5m <sub>9</sub>	.572 <sup>c</sup>	.327	.321	.40317	.016	9.014	1	378	.003
<b>ANOVA</b>									
Model		Sum of Squares	df	Mean Square	F	Sig.			
5m <sub>7</sub>	Regression	25.434	1	25.434	146.800	.000 <sup>a</sup>			
	Residual	65.838	380	.173					
	Total	91.272	381						
5m <sub>8</sub>	Regression	28.364	2	14.182	85.443	.000 <sup>b</sup>			
	Residual	62.908	379	.166					
	Total	91.272	381						
5m <sub>9</sub>	Regression	29.829	3	9.943	61.171	.000 <sup>c</sup>			
	Residual	61.442	378	.163					
	Total	91.272	381						
<b>Coefficients</b>									
Model		Unstandardized Coefficients	Standardized Coefficient	t	Sig.	Collinearity Statistics			

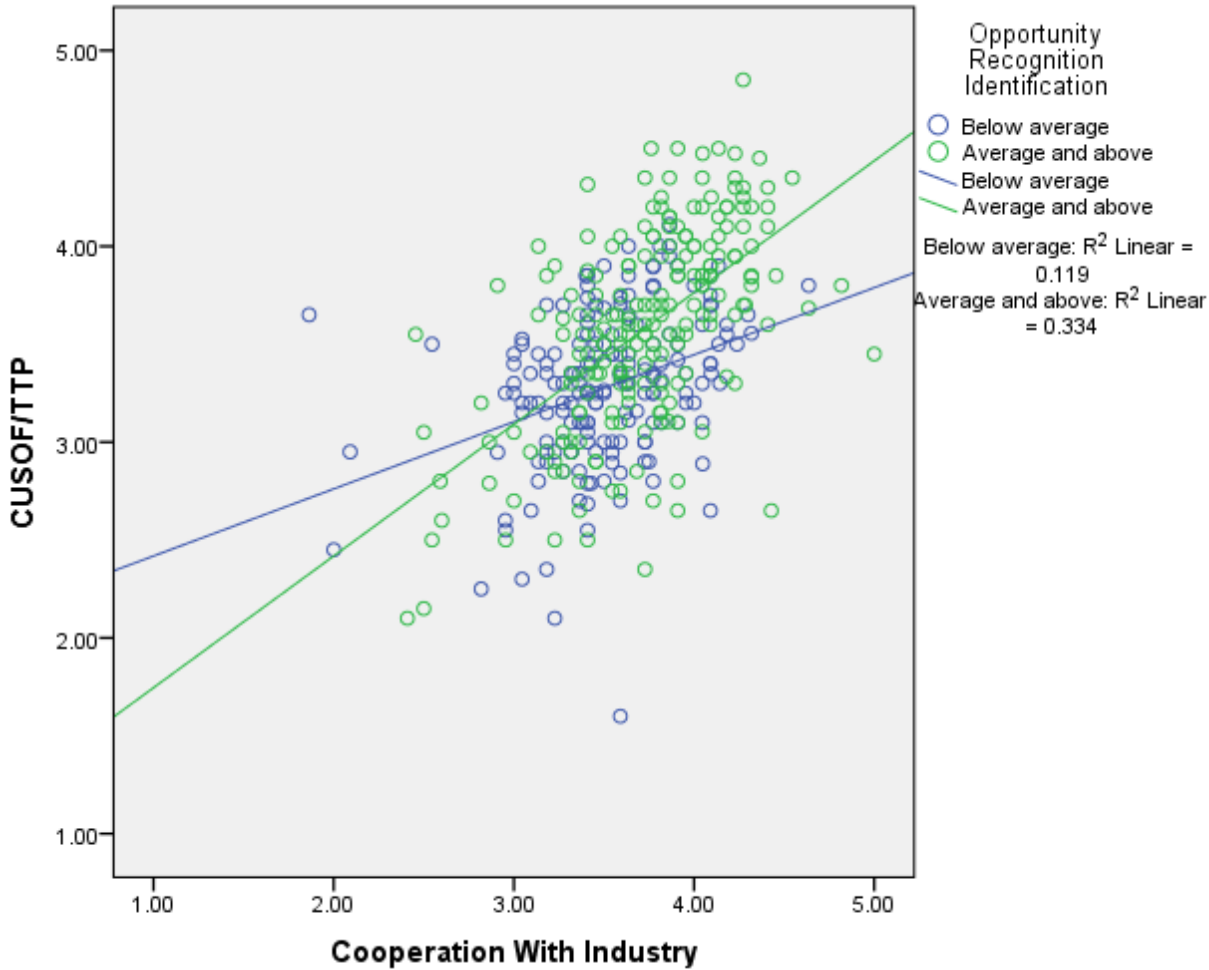


		<b>B</b>	<b>Std. Error</b>	<b>Beta</b>			<b>Tolerance</b>	<b>VI F</b>
5m <sup>7</sup>	(Constant)	3.447	.021		161.863	.000		
	CWI	.590	.049	.528	12.1160	.000	1.000	1.000
5m <sup>8</sup>	(Constant)	3.447	.021		165.382	.000		
	CWI	.531	.050	.475	10.6880	.000	.920	1.087
	OIR	.167	.040	.187	4.2020	.000	.920	1.087
5m <sup>9</sup>	(Constant)	3.431	.021		161.099	.000		
	CWI	.520	.049	.465	10.5520	.000	.915	1.093
	OIR	.174	.039	.195	4.4300	.000	.916	1.091
	CWI*OIR	.236	.078	.127	3.0023	.000	.993	1.007

- a. Predictors: (Constant), Co-operation With Industry (CWI),  
b. Predictors: (Constant), Co-operation With Industry (CWI), Opportunity Identification and Recognition (OIR),  
c. Predictors: (Constant), Co-operation With Industry (CWI), Opportunity Identification and Recognition (OIR), Co-operation With Industry \* Opportunity Identification and Recognition (CWI\*OIR),  
d. Dependent Variable: Creation of university Spin-Off Firms/Technology Transfer process (CUSOF/TTP)

Figure 4.10 presents the interaction between OIR as the moderating variable in the relationship between CWI and CUSOF/TTP in Kenya. The findings shows similar trends that were earlier indicated with ESE and PPN, academics with below average OIR and have minimal CWI have a higher university spin-off firm's predisposition than those with above average OIR. However, academics with average and above average OIR and marginal CWI starts at a lower rate of creation of spin-off but steadily grows with strengthening of CWI and exceeds the below average OIR academics. The inferences were that although both the groups' growth rate for CUSOF/TTP were directly proportional with CWI, below average

OIR side identified the prospects that are embedded in collaborations and exploited their benefits faster than average and above average OIR team. However with improved collaborations with average and above average team, it subdued the below average group and ended up being in the lead to the end. This findings from the moderated regression analysis also show that OIR has a significant moderating effect on the CWI with CUSOF/TTP.



**Figure 4. 10 Moderating effect of co-operation with industry on regression of entrepreneurial self-efficacy on creation of spin-off firms in Kenya**

**Discussion of findings on the moderating effect of Opportunity Identification and Recognition (OIR) on the relationship between Co-operation With Industry (CWI) and Creation of Spin-off Firms (CUSOF/TTP).**

In the study, the null hypothesis stated that opportunity identification and recognition (OIR) has no significant moderating effect on the relationship between Co-operation With Industry (CWI) and the creation of university spin-off firms in Kenya (CUSOF/TTP) however, the results confirmed that the relationship between CWI (independent) and CUSOF/TTP with OIR (moderator) as the predictor was significant ( $F(2, 379) = 85.445$ ,  $p < 0.001$ ).

Notably, upon adding OIR to the model the relationship was still significant ( $\Delta R^2 = 0.032$ ,  $\Delta F = 17.653$ ,  $p < 0.001$ ), ( $\beta = 0.187$ ,  $t = 4.202$ ,  $p < 0.001$ ). Further empirical findings showed that the relationship between with CWI (independent) and CUSOF/TTP with OIR (moderator) as the predictor when CWI\*OIR (interaction term) was added is significant ( $F(3, 378) = 61.171$ ,  $p < 0.001$ ). The results indicated that upon adding the interaction term to model, the  $R^2$  and  $F$  changes were significant respectively ( $\Delta R^2 = 0.016$ ,  $\Delta F = 9.014$ ,  $p = 0.003$ ).  $\beta$ , co-efficient for CWI\*OIR as a predictor was significant, ( $\beta = 0.127$ ,  $t = 3.003$ ,  $p = 0.003$ ), meaning that 1 unit increase in OIR index led to 0.127 units increase in CUSOF/TTP giving it a good predictive value to the regression model.

This imply that OIR significantly moderates the relationship between CWI and CUSOF/TTP.

**4.4.6.6 Moderating effect of Opportunity Identification and Recognition on regression of combined Academic Entrepreneurial Intentions and the Creation of University Spin-off Firms in Kenya.**

This section presents;

*Hypothesis H<sub>05a</sub>: Opportunity identification and recognition have no significant moderating effect on the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya.*

In order to test the moderating effect of OIR on regression of combined AEI on CUSOF/TTP, three (3) regression models were examined. The variables were entered step by step that is ESE, PPN and CWI (independent) began the process , followed by OIR (moderator) as the predictor and finally the ESE\*OIR, PPN\*OIR and CWI\*OIR (interaction terms) were entered sequentially.

The models were fitted;

$$\text{Model 5}_{m_{10}} Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

$$\text{Model 5}_{m_{11}} Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_Z Z_1 + \varepsilon$$

$$\text{Model 5}_{m_{12}} Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_Z Z_1 + \beta_{Z1} X_1 Z_1 + \beta_{Z2} X_2 Z_1 + \beta_{Z3} X_3 Z_1 + \varepsilon$$

**Where**            Y - CUSOF/TTP

$\beta_0$  - Constant

$\beta_1$  - Co-efficient 1,

$\beta_2$  - Coefficient 2,

$\beta_3$  - Coefficient 3

$X_1$  - ESE

$X_2$  - PPN

$X_3$  - CWI

$Z_1$  - OIR (predictor),

$i$  - ESE, PPN, CWI

$\varepsilon$  - Error term

Results in Table 4.29 presents model 5m<sub>10</sub> with ESE, PPN and CWI as independent variables. The model shows that relationship between combined ESE, PPN and CWI and CUSOF/TTP is significant (F (3, 377) =83.684, p<0.001) and ( $\Delta R^2 = 0.400$ ,  $\Delta F=83.684$ , p<0.001). Not to mention, the  $\beta$  co-efficient for ESE, PPN and CWI was significant with ( $\beta =0.109$ , t=2.438, p=0.015), ( $\beta =0.366$ , t=7.375, p<0.001) and ( $\beta =0.288$ , t=5.977, p<0.001) respectively.

Hence, the model equation for combined AIE (ESE, PPN and CWI) was;

$$\text{Model 5m}_{10} Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

$$\text{CUSOF/TTP}=3.450+0.101\text{ESE}+0.303\text{PPN}+0.321\text{CWI}$$

Likewise, model 5m<sub>11</sub> indicates that the relationship between joined ESE, PPN and CWI (independent variables) and OIR (moderator) as the predictor was significant (F (4, 376) =68.883, p<0.001). When OIR was included in the model the relationship was insignificant ( $\Delta R^2=0.005$ ,  $\Delta F =3.088$ , p= 0.080) showing OIR is an insignificant

predictor between a combined AEI and CUSOF/TTP. Additionally,  $\beta$  co-efficient for OIR as a predictor was insignificant ( $\beta = 0.097$ ,  $t = 1.757$ ,  $p = 0.080$ ), meaning that 1 unit increase in OIR, increased CUSOF/TTP by about 0.097 units. The findings confirm that OIR had an insignificant relationship between joined AEI and CUSOF/TTP.

Therefore, the model equation for a combined AEI and OIR was;

$$\text{Model 5m}_{11} Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_Z Z_1 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.450 + 0.040\text{ESE} + 0.303\text{PPN} + 0.317\text{CWI} + 0.086\text{OIR}$$

Over and above, model 5m<sub>12</sub> shows that the relationship was significant between joined AIE (ESE, PPN and CWI as independent variables), OIR (moderator) as the predictor on one hand and when ESE\*OIR, PPN\*OIR and CWI\*OIR (interaction terms) were added on the other hand ( $F(7, 373) = 39.661$ ,  $p < 0.001$ ).

In addition, the empirical results shows when the interaction terms were added to model, both the changes in  $R^2$  and in  $F$  were significant ( $\Delta R^2 = 0.022$ ,  $\Delta F = 4.790$ ,  $p < 0.03$ ).

$\beta$ , co-efficient for ESE\*OIR, PPN\*OIR and CWI\*OIR as a predictor were not significant, significant and not significant respectively ( $\beta = 0.006$ ,  $t = 0.120$ ,  $p = 0.904$ ;  $\beta = 0.151$ ,  $t = 2.951$ ,  $p = 0.003$ ;  $\beta = -0.002$ ,  $t = -0.046$ ,  $p = 0.963$ ). This imply that OIR is not significant when moderating the relationship between both ESE and CWI and CUSOF/TTP but significant when moderating the one with PPN.

The model equation for joint AIE (independent variables), OIR (moderator/predictor), ESE\*OIR, PPN\*OIR and CWI\*OIR (interaction terms).

$$\text{Model } 5m_{12} \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_Z Z_1 + \beta_{Z1} X_1 Z_1 + \beta_{Z2} X_2 Z_1 + \beta_{Z3} X_3 Z_1 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.426 + 0.031 \text{ESE} + 0.292 \text{PPN} + 0.303 \text{CWI} +$$

$$0.097 \text{OIR} + 0.006 \text{ESE} * \text{OIR} + 0.227 \text{PPN} * \text{OIR} - 0.04 \text{CWI} * \text{OIR}$$

In conclusion, the findings confirm that OIR is significant in the relationship between joined AIE and CUSOF/TTP and hence null hypothesis,  $H_{05d}$  is therefore rejected.

**Table 4. 29 Regression results on the moderating effect of Opportunity Identification and Recognition (OIR) on the regression of combined Academic Entrepreneurial Intentions (AEI) and the Creation of University Spin-off Firms (CUSOF/TTP) in Kenya**

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change in R Square	F Change	df 1	df 2	Sig. F Change
5m <sub>10</sub>	.632 <sup>a</sup>	.400	.395	.37869	.400	83.684	3	37	.000
5m <sub>11</sub>	.636 <sup>b</sup>	.405	.398	.37765	.005	3.088	1	37	.080
5m <sub>12</sub>	.653 <sup>c</sup>	.427	.416	.37206	.022	4.790	3	37	.003

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
5m <sub>10</sub>	Regression	36.002	3	12.001	83.684	.000 <sup>a</sup>
	Residual	54.064	377	.143		
	Total	90.067	380			
5m <sub>11</sub>	Regression	36.443	4	9.111	63.883	.000 <sup>b</sup>
	Residual	53.624	376	.143		
	Total	90.067	380			
5m <sub>12</sub>	Regression	38.432	7	5.490	39.661	.000 <sup>c</sup>
	Residual	51.634	373	.138		
	Total	90.067	380			

Co-efficients								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
5m <sub>10</sub>	(Constant)	3.450	.019		177.821	.000		
	ESE	.101	.041	.109	2.438	.015	.793	1.261
	PPN	.303	.041	.366	7.375	.000	.648	1.544
	CWI	.321	.054	.288	5.977	.000	.685	1.460

5m <sub>1</sub>	(Constant	3.450	.019		178.30	.000		
1	)				9			
	ESE	.040	.054	.044	.748	.455	.467	2.143
	PPN	.303	.041	.366	7.394	.000	.648	1.544
	CWI	.317	.054	.285	5.924	.000	.684	1.462
	OIR	.086	.049	.097	1.757	.080	.522	1.916
5m <sub>1</sub>	(Constant	3.426	.022		157.12	.000		
2	)				3			
	ESE	.031	.054	.034	.578	.564	.452	2.212
	PPN	.292	.041	.352	7.075	.000	.621	1.610
	CWI	.303	.053	.272	5.702	.000	.675	1.480
	OIR	.097	.050	.109	1.922	.055	.479	2.089
	ESE*OIR	.006	.053	.006	.120	.904	.712	1.404
	PPN*OIR	.227	.077	.151	2.951	.003	.589	1.697
	CWI*OI	-.004	.093	-.002	-.046	.963	.602	1.662

a. Dependent Variable: Creation of university Spin-Off Firms/Technology Transfer process (CUSOF/TTP)

a. Predictors: (Constant), Co-operation With Industry (**CWI**), Entrepreneurial Self Efficacy (**ESE**), Personal and Professional Networks , (**PPN**)

b. Predictors: (Constant), Co-operation With Industry (**CWI**), Entrepreneurial Self Efficacy (**ESE**), Personal and Professional Networks (**PPN**), Opportunity Identification and Recognition (**OIR**),

c. Predictors: (Constant), Co-operation With Industry (**CWI**), Entrepreneurial Self Efficacy (**ESE**), Personal and Professional Networks (**PPN**), Opportunity Identification and Recognition (**OIR**),

Co-operation With Industry\*Opportunity Identification and Recognition, (**CWI\*OIR**) Entrepreneurial Self Efficacy\*Opportunity Identification and Recognition (**ESE\*OIR**),

Personal and Professional Networks\*Opportunity Identification and Recognition, (**PPN\*OIR**)

Dependent Variable: Creation of university Spin-Off Firms/Technology Transfer process, (CUSOF/TP)

### **Discussion of findings on the moderating effect of Opportunity Identification and Recognition (OIR) on regression of combined Academic Entrepreneurial Intentions (AEI) and the Creation of University Spin-off Firms (CUSOF/TTP) in Kenya**

In the study it was hypothesized that OIR has no significant moderating effect on the relationship between AEI and the CUSOF/TTP in Kenya, however the relationship between joined AEI (independent variables) and CUSOF/TTP with OIR (moderator) as the predictor was significant ( $F(4, 376) = 68.883, p < 0.001$ ).



Remarkably, upon adding OIR to the model the relationship was still significant ( $\Delta R^2=0.005$ ,  $\Delta F =3.088$ ,  $p=0.080$ ), ( $\beta =0.097$ ,  $t=1.757$ ,  $p=0.080$ ). Further empirical findings showed that the relationship between with AEI (independent) and CUSOF/TTP with OIR (moderator) as the predictor when AEI\*OIR (interaction term) was added is significant ( $F(7, 373) =39.661$ ,  $p<0.001$ ). The results indicated that upon adding the interaction term to model, the  $R^2$  and  $F$  changes were significant respectively ( $\Delta R^2=0.022$ ,  $\Delta F =4.790$ ,  $p=0.003$ ).  $\beta$ , co-efficient for AEI\*OIR as a predictor was significant, ( $\beta =0.109$ ,  $t=1.922$ ,  $p=0.055$ ), meaning that 1 unit increase in OIR index led to 0.109 units increase in CUSOF/TTP giving it a good predictive value to the regression model. This imply that OIR significantly moderates the relationship between AEI and CUSOF/TTP.

#### **4.4.7 Moderating effect of University Contextual Elements on regression of Academic Entrepreneurial Intentions and the Creation of University Spin-off Firms in Kenya.**

*Specific objective 6: To examine the influence of moderating effect of university contextual elements on the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya.*

The study set to investigate how university contextual elements (UCE) influence the creation of university spin-off firms (CUSOF/TTP) in Kenya. The UCE was measured using constructs derived from specific environment; the network of suppliers, distributors, government agencies, and other research institutions with which university operates and

the general environment; cultural, economic, legal/political and quality of education but placed on a 5-Point Likert scale, where 1 represented ‘Strongly Disagree (SD)’ and 5 represented ‘Strongly Agree (SA)’.

#### **4.4.7.1 Descriptive Analysis on University Contextual Elements (UCE)**

In Table 4.30; 67.5% (M=3.56, SD=1.117) of the respondents pointed out that the Universities have good facilities for supporting new entrepreneurial innovations and venture. 50.3% (M=3.15, SD=1.179) of the respondents indicated that the university does not provide sufficient incentives and rewards for academics. Fifty one point one percent (M=3.16, SD=1.238) posited that there is weak entrepreneurial culture within the university. This findings corroborate with Akuegwu and Nwi-ue (2016) that investigated developing entrepreneurship culture among university students in South-South, Nigeria. The study found out that universities have not been able to evolve tangible efforts to develop entrepreneurship culture among their regular programme students and hence not achieved tangible results. They observed that this could can be attributed to the inability of universities to place entrepreneurship education in a context that emphasizes practical skills in setting up and managing a business. Rather, the education has been more of theoretical presentation of facts and knowledge. 42% (M=3.11, SD=1.158) of the respondents observed that there were inaccurate technology transfer policies and procedures in the university which are hardly communicated.

In the study it was revealed that 69.2 % (M=3.71, SD=0.836) of the respondents agreed that the technology transfer policy targets creation of growth oriented ventures with emphasis to access to numerous opportunities and resources. Forty eight point eight percent (M=3.28, SD=1.174) of the respondents indicated that there has not been

organizational re-structuring within the universities to promote entrepreneurship and technology transfer. Thirty two point nine percent ( $M=2.85$ ,  $SD=1.103$ ) of the respondents said that the barriers that prevent entrepreneurship development within the organization are well not defined and mitigation measures clearly not outlined. Fifty four point seven percent ( $M=3.51$ ,  $SD=1.084$ ) observed that the universities had either launched or enhanced the existing “multi-disciplinary Entrepreneurship Centre” that has effectively revealed the entrepreneurial intentions and competency of the university.

The findings from the study showed that 43.8 % ( $M=3.07$ ,  $SD=1.171$ ) of the respondents agreed that technology transfer offices did very little to promote linkages between academia, industry and universities. Seventy point two percent ( $M=3.73$ ,  $SD=0.984$ ) of the respondents observed that the existence of incubators in the university has added value to the image of the university and created student employees. Fifty six point one percent ( $M=3.49$ ,  $SD=1.171$ ) of the respondents noted that establishment of Science parks and techno poles within the university has not enhanced the entrepreneurial culture. Seventy four point eight percent ( $M=3.82$ ,  $SD=0.984$ ) opined that technology transfer offices provided a better engagement of academics in knowledge transfer activities, recognized commercial opportunities of research activities. In summary, after achieving a Cronbach threshold of 0.833 (see Appendix 2), the 12 items in table 4.30 explaining the university contextual elements (UCE) were aggregated to get  $Z_2$  score for each respondent  $\bar{x}=3.3690$ . With the means ranging between 2.85 and 3.82 and the standard deviations between 0.836 and 1.238, the results indicated that a majority of the academics agreed with the

statements that universities immediate environment enhance their abilities to start and run spin-off firms.

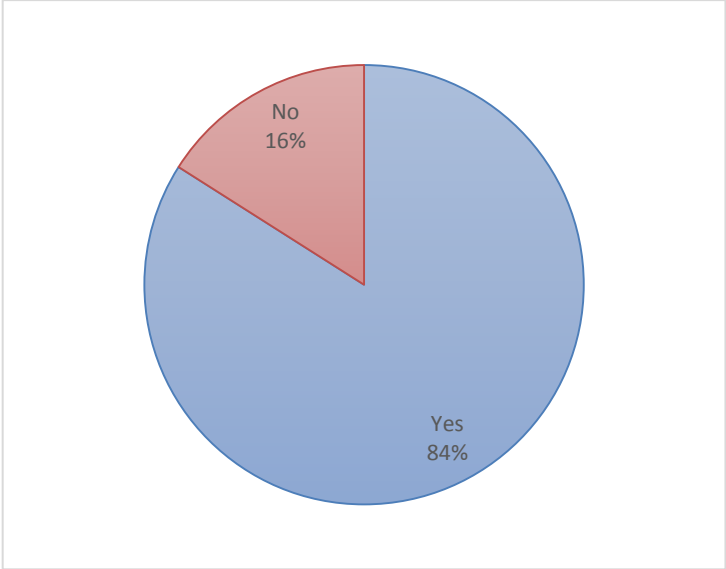
**Table 4. 30 Responses frequencies for University Contextual Elements**

Statement	SD	D	N	A	SA	Mean	Std. Deviation
	%	%	%	%	%		
The university has good facilities for supporting new entrepreneurial innovations and venture.	6.0	15.5	11.0	51.2	16.3	3.56	1.117
The university does not provide sufficient incentives and rewards for academics.	8.1	29.1	12.6	40.6	9.7	3.15	1.179
There is weak entrepreneurial culture within the university.	9.8	27.7	11.4	38.6	12.5	3.16	1.238
There are inaccurate technology transfer policies and procedures in the university which are hardly communicated.	4.2	36.2	17.5	28.8	13.2	3.11	1.158
The technology transfer policy targets creation of growth oriented ventures with emphasis to access to numerous opportunities and resources.	1.3	8.1	21.4	56.7	12.5	3.71	.836
No organizational re-structuring has been conducted within the universities to promote entrepreneurship and technology transfer.	5.0	27.4	18.9	32.4	16.3	3.28	1.174
Barriers that prevent entrepreneurship development within the organization are not well defined and mitigation measures not outlined.	6.3	42.8	18.0	25.3	7.6	2.85	1.103
University has either launched or enhanced the existing “multi-disciplinary Entrepreneurship Centre” that has effectively revealed the entrepreneurial intentions and competency of the university.	3.1	17.3	24.9	35.3	19.4	3.51	1.084
The Technology transfer offices do very little to promote linkages between academia and industry other universities.	7.9	31.2	17.1	33.6	10.2	3.07	1.171
The existence of incubators in the university has added value to the image of the university and created student employees.	2.9	10.5	63	50.8	19.4	3.73	.984
Establishment of Science parks and techno poles within the university has not enhanced the entrepreneurial culture.	5.2	18.6	76	34.6	21.5	3.49	1.171
Technology transfer offices provides a better engagement of academics in knowledge transfer activities, recognizes commercial opportunities of research activities.	3.1	8.9	50	52.2	22.6	3.82	.984

$n=387, \bar{x}=3.3690, S=0.64866$

$SD=Strongly Disagree, D=Disagree, N=Neutral A=Agree, SA= Strongly Agree$

Figure 4.8 indicate that 84 % of the respondents agreed and 16% of the respondents disagreed to the question that university mission, vision and core strategy encourage entrepreneurship and technology/knowledge transfer among staff and students.



**Figure 4. 11 University mission, vision and core strategy encourage entrepreneurship and technology/knowledge transfer among staff and students**

Table 4.31 further explains the response to the Figure 4.8 above. From the research study, 30.5 % of respondents observed that their institution’s vision to train graduates for global excellence in innovation, research and development, 26.1% of participants agreed that their universities continuously motivates entrepreneurs and encourage global research, 12.1% of respondents commended that their mission and vision was poorly executed and inefficient. Moreover, 9.3 % of respondents posited that the various institutions should increase efficiency of upcoming graduates so as to fit in the job market or business. Lastly, 5.9 % observed that entrepreneurship knowledge is shared as a course at the university level across most programmes.

**Table 4.31 Explanation on University mission, vision and core strategy encourage entrepreneurship and technology/knowledge transfer among staff and students**

	Frequency	Percent
Trains in global excellence, research and development in innovation	118	32.0
Motivation of entrepreneurs & encourage global research	101	27.4
Poorly executed and inefficient	47	12.7
Linking up with related bodies to spearhead	44	11.9
Increase efficiency of upcoming graduates	36	9.8
Entrepreneurship knowledge is shared as a course	23	6.2
Total	387	100.0

#### 4.4.7.2 Correlation results on University Contextual Elements (UCE)

The study needed to establish the linear relationship between University Contextual Elements (UCE) and Creation of University Spin-Off Firms/Technology Transfer Process (CUSOF/TTP). The Table 4.32 shows that there is positive correlation between UCE and the CUSOF/TTP,  $r(387) = 0.592$ ,  $p\text{-value} < .001$ .

**Table 4. 32 Correlation results on University Contextual Elements (UCE) and Creation of University Spin-Off Firms/ Technology Transfer Process (CUSOF/TTP)**

		UC	CUSOF/TTP
UC	Pearson Correlation	1	.592**
	Sig. (2-tailed)		.000
	N	387	387

\*\* . Correlation is significant at the 0.01 level (99% confidence level) (2-tailed).

#### 4.4.7.3 Regression results on the moderating effect of University Contextual Elements on the regression of Entrepreneurial Self Efficacy on the Creation of University Spin-off Firms in Kenya.

Despite the fact that the correlation results shown in Table 4.32 indicated that there is a positive relationship between UCE and CUSOF/TTP, a regression analysis was run to find out the extent of moderating effect of UC on relationship between AEI and CUSOF/TTP.

The variable had sub-hypothesis namely; H6<sub>a</sub>, H6<sub>b</sub> and H6<sub>c</sub> with the moderator being the predictor and also the interaction term. In H6<sub>d</sub>, the moderating effect of UCE on the joint relationship between AEI was examined using a moderated multiple regression model.

Thus;

A hypothesis to guide the research was as follows;

**Hypothesis H<sub>06</sub>:** University contextual elements have no significant moderating effect on the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya.

*Hypothesis H<sub>06a</sub>:* University contextual elements have no significant moderating effect on the relationship between entrepreneurial self-efficacy and the creation of university spin-off firms in Kenya.

*Hypothesis H<sub>06b</sub>:* University contextual elements have no significant moderating effect on the relationship between personal and professional networks and the creation of university spin-off firms in Kenya.

*Hypothesis H<sub>06c</sub>:* University contextual elements have no significant moderating effect on the relationship between co-operation with industry and the creation of university spin-off firms in Kenya.

*Hypothesis H<sub>06d</sub>:* University contextual elements have no significant moderating effect on the relationship between joint

*academic entrepreneurial intentions the creation of university spin-off firms in Kenya.*

This section covers;

**Hypothesis H<sub>06a</sub>:** *University contextual elements have no significant moderating effect on the relationship between entrepreneurial self-efficacy and the creation of university spin-off firms in Kenya.*

In order to test the moderating effect of UCE on the regression of ESE on CUSOF/TTP, three (3) regression models were considered whereby the variables were entered serially that is ESE (independent) was entered first, followed by UCE (moderator) as the predictor and finally the ESE\*UCE (interaction term). Remarkably, all the three models were significant (p<0.001 in all the three cases).

The following models were fitted;

$$\text{Model 6m}_1 \quad Y = \beta_0 + \beta_1 X_1 + \varepsilon$$

$$\text{Model 6m}_2 \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 Z_2 + \varepsilon$$

$$\text{Model 6m}_3 \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 Z_2 + \beta_3 X_1 Z_2 + \varepsilon$$

**Where**  $Y$  - CUSOF/TTP

$\beta_0$  - Constant

$\beta_1$  - Co-efficient 1,

$\beta_2$  - Coefficient 2,

$\beta_3$  - Coefficient 3,

$X_1$  - ESE,



$Z_2$  - UCE (predictor),

$\varepsilon$  - Error term

Table 4.33 presents Model 6m<sub>1</sub> with ESE as independent variable. The model shows that relationship between ESE and CUSOF/TTP is significant (F (1, 380) =57.218, p<0.001) and ( $\Delta R^2=0.131$ ,  $\Delta F=57.218$ , p<0.001). Furthermore,  $\beta$  co-efficient for ESE was significant ( $\beta =0.362$ , t=7.564, p<0.001).

Hence, the model equation for ESE was;

$$\text{Model 6m}_1 \quad Y = \beta_0 + \beta_1 X_1 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.447 + 0.336 \text{ESE}$$

Similarly, Model 6m<sub>2</sub> shows that the relationship between ESE (independent) and UCE (moderator) as the predictor was significant (F (2, 379) =110.595, p<0.001). The model shows that upon adding OIR the relationship is also significant ( $\Delta R^2=0.238$ ,  $\Delta F =142.645$ , p<0.001) indicating UCE is a significant predictor between ESE and CUSOF/TTP. In addition,  $\beta$  co-efficient for OIR as a predictor was significant ( $\beta =0.532$ , t=11.943, p<0.001), meaning that 1 unit increase in UCE, increased CUSOF/TTP by about 0.532 units. The findings confirm that UCE is significant in the relationship between ESE and CUSOF/TTP.

Therefore, the model equation for ESE and UCE was;

$$\text{Model 6m}_2 \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 Z_2 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.447 + 0.138 \text{ESE} + 0.401 \text{UCE}$$

Furthermore, Model 6m<sub>3</sub> shows that the relationship between with ESE (independent), UCE (moderator) as the predictor when ESE\*UCE (interaction term) was added is

significant ( $F(3, 378) = 79.273, p < 0.001$ ). In addition, the results show that upon adding the interaction term to model, the  $R^2$  and  $F$  changes were significant respectively ( $\Delta R^2 = 0.018, \Delta F = 10.868, p = 0.001$ ).  $\beta$ , co-efficient for ESE\*UCE as a predictor was significant, ( $\beta = 0.136, t = 3.297, p = 0.001$ ), meaning that 1 unit increase in OIR index led to 0.136 units increase in CUSOF/TTP giving it a substantial predictive value to the regression model. This implies that UCE significantly moderates the relationship between ESE and CUSOF/TTP.

The model equation for ESE, UCE and ESE\*UCE was:

$$\text{Model 6m}_3 \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 Z_2 + \beta_3 X_1 Z_2 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.420 + 0.153\text{ESE} + 0.378\text{UCE} + 0.196\text{ESE*UCE}$$

In conclusion, the findings confirm that UCE is significant in the relationship between ESE and CUSOF/TTP and hence null hypothesis,  $H_{05a}$  is therefore rejected.

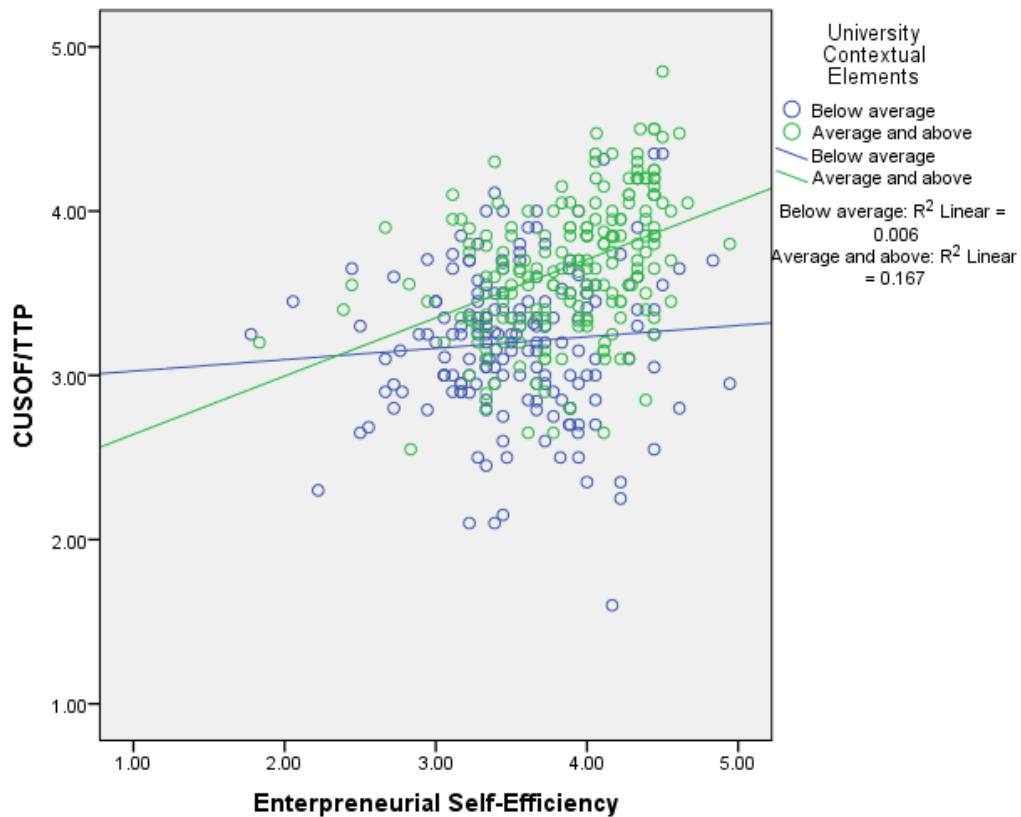
**Table 4. 33 Regression results on moderating effect of University Contextual Elements (UCE) on the regression of Entrepreneurial Self Efficacy (ESE) on the Creation of University Spin-off Firms in Kenya (CUSOF/TTP).**

Model Summary										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change in R Square	F Change	df1	df2	Sig.	F Change
6m <sub>1</sub>	.362 <sup>a</sup>	.131	.129	.45690	.131	57.218	1	380	.000	
6m <sub>2</sub>	.607 <sup>b</sup>	.369	.365	.38996	.238	142.645	1	379	.000	
6m <sub>3</sub>	.621 <sup>c</sup>	.386	.381	.38498	.018	10.868	1	378	.001	
ANOVA										
Model		Sum of Squares	df	Mean Square	F	Sig.				
6m <sub>1</sub>	Regression	11.945	1	11.945	57.218	.000 <sup>a</sup>				
	Residual	79.327	380	.209						
	Total	91.272	381							
6m <sub>2</sub>	Regression	33.637	2	16.818	110.595	.000 <sup>b</sup>				
	Residual	57.635	379	.152						
	Total	91.272	381							
6m <sub>3</sub>	Regression	35.248	3	11.749	79.273	.000 <sup>c</sup>				
	Residual	56.024	378	.148						
	Total	91.272	381							
Co-efficients										
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics			
		B	Std. Error	Beta			Tolerance	VIF		
6m <sub>1</sub>	(Constant)	3.447	.023		147.437	.000				
	ESE	.336	.044	.362	7.564	.000	1.000	1.000		
6m <sub>2</sub>	(Constant)	3.447	.020		172.746	.000				
	ESE	.138	.041	.149	3.340	.001	.840	1.191		
	UCE	.401	.034	.532	11.943	.000	.840	1.191		
6m <sub>3</sub>	(Constant)	3.420	.021		160.511	.000				
	ESE	.153	.041	.164	3.713	.000	.830	1.204		
	UCE	.378	.034	.501	11.143	.000	.803	1.245		
	ESE*UCE	.196	.060	.136	3.297	.001	.956	1.046		

a. Predictors: (Constant), Entrepreneurial Self Efficacy (ESE)  
b. Predictors: (Constant), Entrepreneurial Self Efficacy (ESE), University Contextual Elements (UCE) (UC)  
c. Predictors: (Constant), Entrepreneurial Self Efficacy (ESE), University Contextual Elements (UCE) ,Entrepreneurial Self Efficacy\*University Contextual Elements (ESE\*UCE)  
d. Dependent Variable: Creation of university Spin-Off Firms/Technology Transfer process (CUSOF/TTP)

Figure 4.12 clearly shows the interaction between UCE as the moderating variable in the relationship between ESE and CUSOF/TTP in Kenya. The findings indicate that with marginal ESE, academics with below average UCE have a higher university creation of

spin-off firm's ability than those with above average UCE. However the rate of increase of spin-off potential is higher for those with average and above average UCE as ESE increases. This findings from the moderated regression analysis also show that UCE has a significant moderating effect on the ESE with CUSOF/TTP.



**Figure 4. 12 Moderating effect of university contextual elements on regression of entrepreneurial self–efficacy on creation of spin-off firms in Kenya.**

**Discussion of findings on the moderating effect of University Contextual Elements (UCE) on the regression of Entrepreneurial Self Efficacy (ESE) on the Creation of University Spin-off Firms in Kenya (CUSOF/TTP).**

This section discusses the findings on objective six of the study which focusses on the moderating effect of UCES on the relationship between ESE and the CUSOF/TTP.

University contextual elements were measured using 5-point likert scale with 1= 'Strongly Disagree' and 5= 'Strongly Agree' statements derived from five main stages of opportunity identification and recognition namely; getting the idea/scanning the environment, identifying the opportunity, developing the opportunity, evaluating the opportunity and evaluating the team.

The descriptive analysis showed that the 11 items in Table 4.30 describe the process of opportunity identification and recognition (OIR) were aggregated to get  $Z_1$  score for each respondent ( $\bar{x}=3.8928, S=0.54896$ ). With the means ranging between 3.34 and 4.21 and the standard deviations between 0.789 and 1.300, the results indicate that a majority of the academics agreed with the statements and were leveraging on their contacts, prior knowledge and environment to recognize opportunities.

The inferential statistics showed that there is positive correlation between OIR and the CUSOF/TTP ( $r(387) = 0.321, p\text{-value} < .001$ ). In addition, the model shows that the relationship between ESE (independent) and CUSOF/TTP with OIR (moderator) as the predictor was significant ( $F(2, 379) = 31.043, p < 0.001$ ). Notably, upon adding OIR to the model the relationship was still significant ( $\Delta R^2 = 0.010, \Delta F = 4.363, p = 0.037$ ), ( $\beta = 0.137, t = 2.089, p < 0.001$ ). Further empirical findings showed that the relationship between with ESE (independent) and CUSOF/TTP with OIR (moderator) as the predictor when ESE\*OIR (interaction term) was added is significant ( $F(3, 378) = 26.272,$

$p < 0.001$ ). The results indicated that upon adding the interaction term to model, the  $R^2$  and F changes were significant respectively ( $\Delta R^2 = 0.032$ ,  $\Delta F = 14.517$ ,  $p < 0.001$ ).  $\beta$ , co-efficient for ESE\*OIR as a predictor was significant, ( $\beta = 0.195$ ,  $t = 3.810$ ,  $p < 0.001$ ), meaning that 1 unit increase in OIR index led to 0.195 units increase in CUSOF/TTP giving it a substantial predictive value to the regression model. This implies that OIR significantly moderates the relationship between ESE and CUSOF/TTP.

These findings are similar to Akuegwu and Nwi-ue (2016) survey-designed study that investigated the developing of entrepreneurship culture for global relevance among university students in South-South Nigeria that sampled 340 participants in University of Benin, University of Calabar, University of Uyo and University of Port Harcourt. The researchers concluded that university environments is compromised of the most significant factors that affect students' perceptions towards entrepreneurial career and entrepreneurial convictions. Moreover, universities should exert more efforts in developing entrepreneurship culture by making entrepreneurship education more practical oriented in order for students to be exposed to firsthand knowledge about setting up and managing new ventures, which may go a long way to make students job creators and not seekers.

This results correspondence with Smilor et al (1990) who argued that among the variety of organizations, the university is considered the most important organizational influence on the spin-out company. The university is outstandingly important as a source of personnel and ideas in both the creation and development of the spin-out company. In

addition, the University plays an important role as a source of consultants and research expertise as the company starts and grows. Fundamental hindrances facing the spin-out company, such as raising capital, managing growth and penetrating new markets, revolve around business rather than technological concerns. A range of institutional structures and increased access to university resources are predicted to directly contribute to the creation of spin-off firms (Smilor et al., 1990).

**4.4.7.4 Regression results on the moderating effect of University Contextual Elements on the regression of Personal and Professional Networks on the Creation of Spin-off firms in Kenya.**

This sections covers;

***Hypothesis H<sub>06b</sub>:** University contextual elements have no significant moderating effect on the relationship between personal and professional networks and the creation of university spin-off firms in Kenya.*

In order to test the moderating effect of UCE on regression of PPN on CUSOF/TTP, three (3) regression models were examined whereby the variables were entered sequentially that is PPN (independent) was entered first, followed by UCE (moderator) as the predictor and finally the PPN\*UCE (interaction term). Notably, the three models were significant (p<0.001 in all the three cases).

The models were fitted;

$$\text{Model 6m}_4 \quad Y = \beta_0 + \beta_1 X_2 + \varepsilon$$

$$\text{Model 6m}_5 \quad Y = \beta_0 + \beta_1 X_2 + \beta_2 Z_2 + \varepsilon$$

$$\text{Model 6m}_6 \quad Y = \beta_0 + \beta_1 X_2 + \beta_2 Z_2 + \beta_3 X_2 Z_2 + \varepsilon$$

**Where**             $Y$  - CUSOF/TTP

$\beta_0$  - Constant

$\beta_1$  - Co-efficient 1,

$\beta_2$  - Coefficient 2,

$\beta_3$  - Coefficient 3

$X_2$  - PPN,

$Z_2$  – UCE (predictor),

$\varepsilon$  - Error term

Table 4.34 presents model 5m<sub>4</sub> with PPN as independent variable. The model shows that the relationship between PPN and CUSOF/TTP is significant (F (1, 379) =180.523, p<0.001) and ( $\Delta R^2=0.323$ ,  $\Delta F=180.523$ , p<0.001). In addition,  $\beta$  co-efficient for PPN was significant ( $\beta =0.568$ , t=13.436, p<0.001).

Hence, the model equation for PPN was;

$$\text{Model 6m}_4 \quad Y = \beta_0 + \beta_1 X_2 + \beta_2 Z_1 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.449 + 0.281\text{PPN} + 0.289\text{UCE}$$

Alike, model 6m<sub>5</sub> shows that the relationship between PPN (independent) and UCE (moderator) as the predictor was significant (F (2, 378) =135.070, p<0.001). The model indicate that upon adding UCE the relationship is also significant ( $\Delta R^2=0.094$ ,  $\Delta F =61.026$ , p<0.001) indicating UCE is a significant predictor between PPN and CUSOF/TTP. Correspondingly,  $\beta$  co-efficient for UCE as a predictor was significant



( $\beta = 0.383$ ,  $t = 7.812$ ,  $p < 0.001$ ), meaning that 1 unit increase in UCE, increased CUSOF/TTP by about 0.383 units. The findings confirm that UCE is significant in the relationship between PPN and CUSOF/TTP.

Therefore, the model equation for PPN and UCE was;

$$\text{Model 6m}_5 \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 Z_2 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.449 + 0.281 \text{ESE} + 0.289 \text{UCE}$$

Besides, model 6m<sub>6</sub> shows that the relationship between with PPN (independent), UCE (moderator) as the predictor when PPN\*UCE (interaction term) was added is significant ( $F(3, 377) = 95.597$ ,  $p < 0.001$ ). When the interaction term to model was added to the model, the results show that changes in  $R^2$  and  $F$  were significant ( $\Delta R^2 = 0.015$ ,  $\Delta F = 10.127$ ,  $p = 0.002$ ). The  $\beta$ , co-efficient for UCE as a predictor was significant, ( $\beta = 0.124$ ,  $t = 3.182$ ,  $p = 0.002$ ), meaning that 1 unit increase in UCE index led to 0.124 units increase in CUSOF/TTP giving it a sizeable predictive value to the regression model. This implies that UCE significantly moderates the relationship between PPN and CUSOF/TTP.

The model equation for PPN, UCE and ESE\*UCE was:

$$\text{Model 6m}_6 \quad Y = \beta_0 + \beta_1 X_2 + \beta_2 Z_2 + \beta_3 X_2 Z_2 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.418 + 0.283 \text{PPN} + 0.289 \text{UCE} + 0.137 \text{PPN} * \text{UCE}$$

In summary, the findings confirm that UCE is significant in the relationship between PPN and CUSOF/TTP and hence null hypothesis,  $H_{06b}$  is therefore rejected.

**Table 4. 34 Regression results on the moderating effect of University Contextual Elements (UCE) on the regression of Personal and Professional Networks (PPN) on the Creation of Spin-off firms in Kenya (CUSOF/TTP).**

<b>Model Summary</b>										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change in R Square	F Change	df1	df2	Sig. F Change	
6m <sub>4</sub>	.568 <sup>a</sup>	.323	.321	.40121	.323	180.523	1	379	.000	
6m <sub>5</sub>	.646 <sup>b</sup>	.417	.414	.37278	.094	61.026	1	378	.000	
6m <sub>6</sub>	.657 <sup>c</sup>	.432	.428	.36835	.015	10.127	1	377	.002	

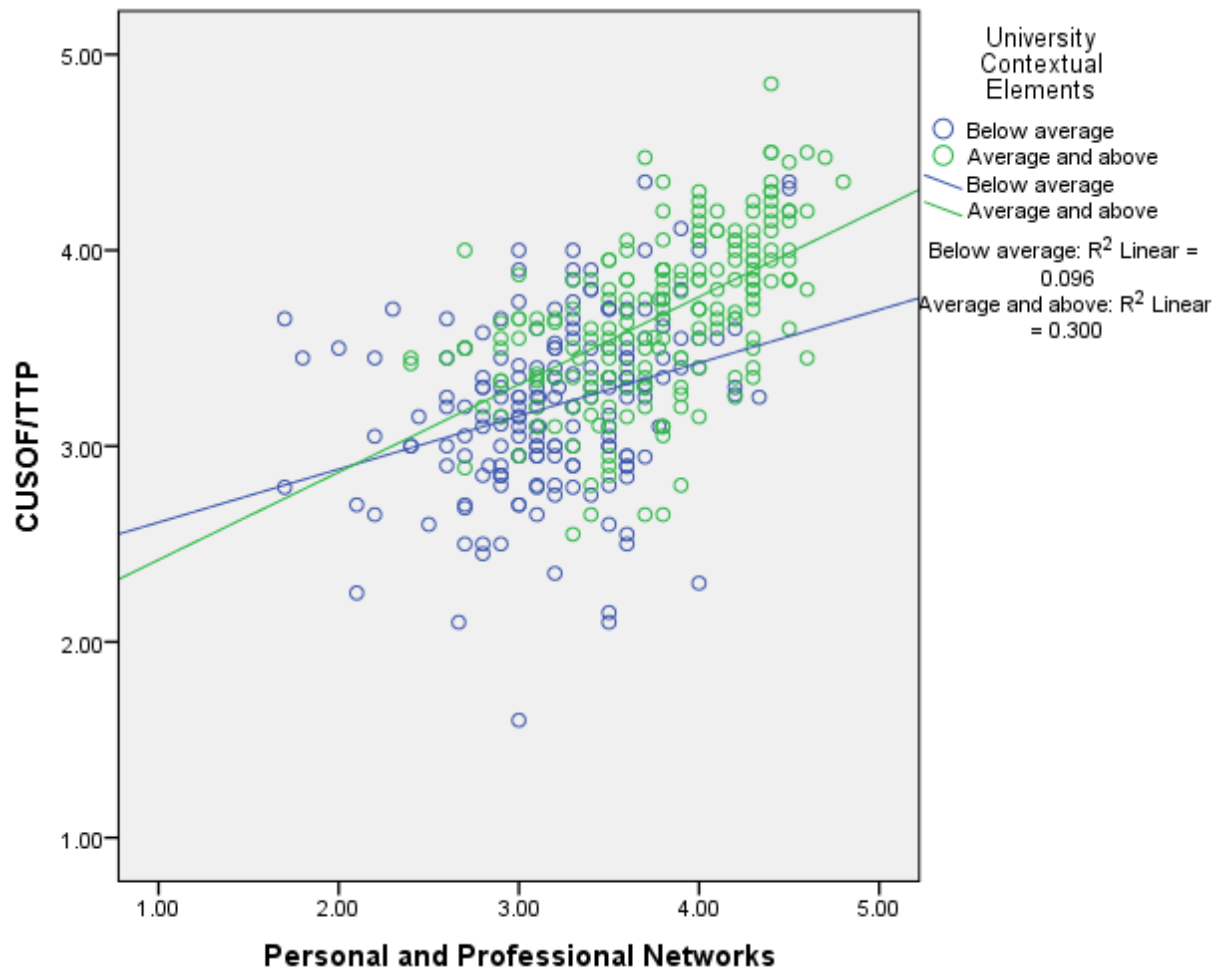
<b>ANOVA</b>						
Model		Sum of Squares	df	Mean Square	F	Sig.
6m <sub>4</sub>	Regression	29.059	1	29.059	180.523	.000 <sup>a</sup>
	Residual	61.008	379	.161		
	Total	90.067	380			
6m <sub>5</sub>	Regression	37.539	2	18.770	135.070	.000 <sup>b</sup>
	Residual	52.527	378	.139		
	Total	90.067	380			
6m <sub>6</sub>	Regression	38.913	3	12.971	95.597	.000 <sup>c</sup>
	Residual	51.153	377	.136		
	Total	90.067	380			

<b>Co-efficients</b>							
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics
		B	Std. Error	Beta			Tolerance VIF
6m <sub>4</sub>	(Constant)	3.450	.021		167.838	.000	
	PPN	.471	.035	.568	13.436	.000	1.000
6m <sub>5</sub>	(Constant)	3.449	.019		180.568	.000	
	PPN	.281	.041	.339	6.908	.000	.642
	UCE	.289	.037	.383	7.812	.000	.642
6m <sub>6</sub>	(Constant)	3.418	.021		160.960	.000	
	PPN	.283	.040	.342	7.053	.000	.641
	UCE	.289	.037	.383	7.900	.000	.642

PPN*UC	.137	.043	.124	3.182	.00	.999	1.001
					2		
a.	Predictors: (Constant), Personal and Professional Networks (PPN)						
b.	Predictors: (Constant), Personal and Professional Networks (PPN), University Contextual Elements (UCE)						
c.	Predictors: Personal and Professional Networks (PPN), University Contextual Elements (UCE), Personal and Professional Networks*University Contextual Elements (UCE) (PPN*UCE)						
d.	Dependent Variable: Creation of university Spin-Off Firms/Technology Transfer process. (CUSOF/TTP)						

Figure 4.13 clearly shows the interaction between UCE as the moderating variable in the relationship between PPN and CUSOF/TTP in Kenya. Similar to findings in ESE, academics with below average UCE but had slight PPN had a higher university spin-off firm's tendency than those with above average UCE. However, academics with above average UCE and minimal PPN starts creating spin-off at a rate slightly below it but gradually grows with growth of PPN and exceeds the below average OIR academics and makes the gap wider than in the beginning. The inferences were that although both the groups' growth rate for CUSOF/TTP were directly proportional with PPN, below average UCE team took an early lead than above average UCE group but slackened down with the later bolstered with more associations. This findings from the moderated regression analysis also show that UCE has a significant moderating effect on the PPN with CUSOF/TTP.



**Figure 4. 13 Moderating effect of university contextual elements on regression of personal and professional networks on creation of spin-off firms in Kenya.**

**Discussion of findings on the moderating effect of university contextual elements (UCE) on the regression of Personal Professional Networks (PPN) on Creation of Spin-off firms (CUSOF/TTP).**

Notwithstanding the null hypothesis stated that university contextual elements (UCE) has no significant moderating effect on the relationship between personal and professional networks (PPN) and the creation of university spin-off firms in Kenya (CUSOF/TTP), the empirical findings rejected that and established that the relationship between PPN

(independent) and CUSOF/TTP with UCE (moderator) as the predictor was significant ( $F(2, 378) = 135.070, p < 0.001$ ).

Remarkably, upon adding UCE to the model the relationship was still significant ( $\Delta R^2 = 0.094, \Delta F = 61.026, p < 0.001$ ), ( $\beta = 0.383, t = 7.812, p < 0.001$ ). Additional findings showed that the relationship between with PPN (independent) and CUSOF/TTP with UCE (moderator) as the predictor when PPN\*UCE (interaction term) was added is significant ( $F(3, 377) = 95.597, p < 0.001$ ). The results indicated that upon adding the interaction term to model, the  $R^2$  and  $F$  changes were significant respectively ( $\Delta R^2 = 0.015, \Delta F = 10.127, p = 0.002$ ).  $\beta$ , co-efficient for PPN\*OIR as a predictor was significant, ( $\beta = 0.124, t = 3.182, p = 0.002$ ), meaning that 1 unit increase in UCE index led to 0.124 units increase in CUSOF/TTP giving it a fair predictive value to the regression model. This imply that UCE significantly moderates the relationship between PPN and CUSOF/TTP.

#### **4.4.7.5 Regression results on the moderating effect of University Contextual Elements on the regression of Co-operation With Industry on the Creation of University Spin-off firms in Kenya.**

This sections covers;

*Hypothesis H<sub>06c</sub>: University contextual elements have no significant moderating effect on the relationship between co-operation with industry and the creation of university spin-off firms in Kenya.*

In order to test the moderating effect of UCE on regression of CWI on CUSOF/TTP, three (3) regression models were studied where the variables were entered step by step that is CWI (independent) was entered first, followed by UCE (moderator) as the predictor and finally the CWI\*UCE (interaction term). Importantly, the three models were significant ( $p < 0.001$  in all the three cases).

The models were fitted;

$$\text{Model 6m7 } Y = \beta_0 + \beta_1 X_3 + \varepsilon$$

$$\text{Model 6m8 } Y = \beta_0 + \beta_1 X_3 + \beta_2 Z_2 + \varepsilon$$

$$\text{Model 6m9 } Y = \beta_0 + \beta_1 X_3 + \beta_2 Z_2 + \beta_3 X_3 Z_2 + \varepsilon$$

**Where**  $Y$  - CUSOF/TTP

$\beta_0$  - Constant

$\beta_1$  - Co-efficient 1,

$\beta_2$  - Coefficient 2,

$\beta_3$  - Coefficient 3

$X_3$  - CWI

$Z_2$  - UCE (predictor),

$\varepsilon$  - Error term

Table 4.35 presents model 6m7, CWI as the independent variable. The model shows that relationship between CWI and CUSOF/TTP is significant ( $F(1, 380) = 146.800$ ,

$p < 0.001$ ), and ( $\Delta R^2 = 0.279$ ,  $\Delta F = 146.800$ ,  $p < 0.001$ ). In addition,  $\beta$  co-efficient for CWI was also significant ( $\beta = 0.528$ ,  $t = 12.116$ ,  $p < 0.001$ ).

Hence, the model equation for CWI was;

$$\text{Model 6m}_7 \quad Y = \beta_0 + \beta_1 X_3 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.447 + 0.590 \text{CWI}$$

Evidently, model 6m<sub>8</sub> shows that the relationship between CWI (independent) and UCE (moderator) as the predictor is significant ( $F(2, 379) = 120.781$ ,  $p < 0.001$ ). The empirical findings indicate that when UCE was added the relationship was still significant ( $\Delta R^2 = 0.111$ ,  $\Delta F = 68.635$ ,  $p < 0.001$ ) hence it was concluded that UCE is a significant predictor between CWI and CUSOF/TTP. Additionally,  $\beta$  co-efficient for OIR as a predictor was significant ( $\beta = 0.430$ ,  $t = 8.285$ ,  $p < 0.001$ ), meaning that 1 unit increase in UCE, increased CUSOF/TTP by about 0.430 units. The findings confirm that UCE is significant in the relationship between CWI and CUSOF/TTP.

Therefore, the model equation for CWI and UCE was;

$$\text{Model 6m}_8 \quad Y = \beta_0 + \beta_1 X_3 + \beta_2 Z_1 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.447 + 0.286 \text{CWI} + 0.324 \text{UCE}$$

Moreover, Model 6m<sub>9</sub> shows that the relationship between with CWI (independent), UCE (moderator) as the predictor when CWI\*UCE (interaction term) was added is significant ( $F(3, 378) = 81.872$ ,  $p < 0.001$ ). Similarly, the results shows that when the interaction term was added to model, the changes in  $R^2$  and  $F$  were significant respectively ( $\Delta R = 0.005$ ,

$\Delta F = 2.865$ ,  $p = 0.091$ ). The  $\beta$ , co-efficient for UCE as a predictor was significant, ( $\beta = 0.068$ ,  $t = 1.693$ ,  $p = 0.091$ ), meaning that 1 unit increase in OIR index led to 0.068 units increase in CUSOF/TTP giving it a fair predictive value to the regression model. This imply that UCE significantly moderates the relationship between CWI and CUSOF/TTP.

The model equation for CWI, UCE and CWI\*UCE was:

$$\text{Model 6m}_9 \quad Y = \beta_0 + \beta_1 X_3 + \beta_2 Z_2 + \beta_3 X_3 Z_2 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.428 + 0.299\text{CWI} + 0.321\text{UCE} + 0.104\text{CWI*UCE}$$

In conclusion, the findings confirm that UCE is significant in the relationship between CWI and CUSOF/TTP and hence null hypothesis,  $H_{06c}$  is therefore rejected.

**Table 4. 35 Regression results on the moderating effect of University Contextual Elements (UCE) on the regression of Co-operation With Industry (CWI) on the Creation of University Spin-off firms in Kenya (CUSOF/TTP).**

Model Summary										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change in R Square	F Change	df 1	df2	Sig. Change	F
6m <sub>7</sub>	.528 <sup>a</sup>	.279	.277	.41624	.279	146.800	1	380	.000	
6m <sub>8</sub>	.624 <sup>b</sup>	.389	.386	.38351	.111	68.635	1	379	.000	
6m <sub>9</sub>	.628 <sup>c</sup>	.394	.389	.38257	.005	2.865	1	378	.091	

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
6m <sub>7</sub>	Regression	25.434	1	25.434	146.800	.000 <sup>a</sup>
	Residual	65.838	380	.173		
	Total	91.272	381			
6m <sub>8</sub>	Regression	35.529	2	17.764	120.781	.000 <sup>b</sup>
	Residual	55.743	379	.147		
	Total	91.272	381			
6m <sub>9</sub>	Regression	35.948	3	11.983	81.872	.000 <sup>c</sup>
	Residual	55.324	378	.146		
	Total	91.272	381			

Co-efficients	
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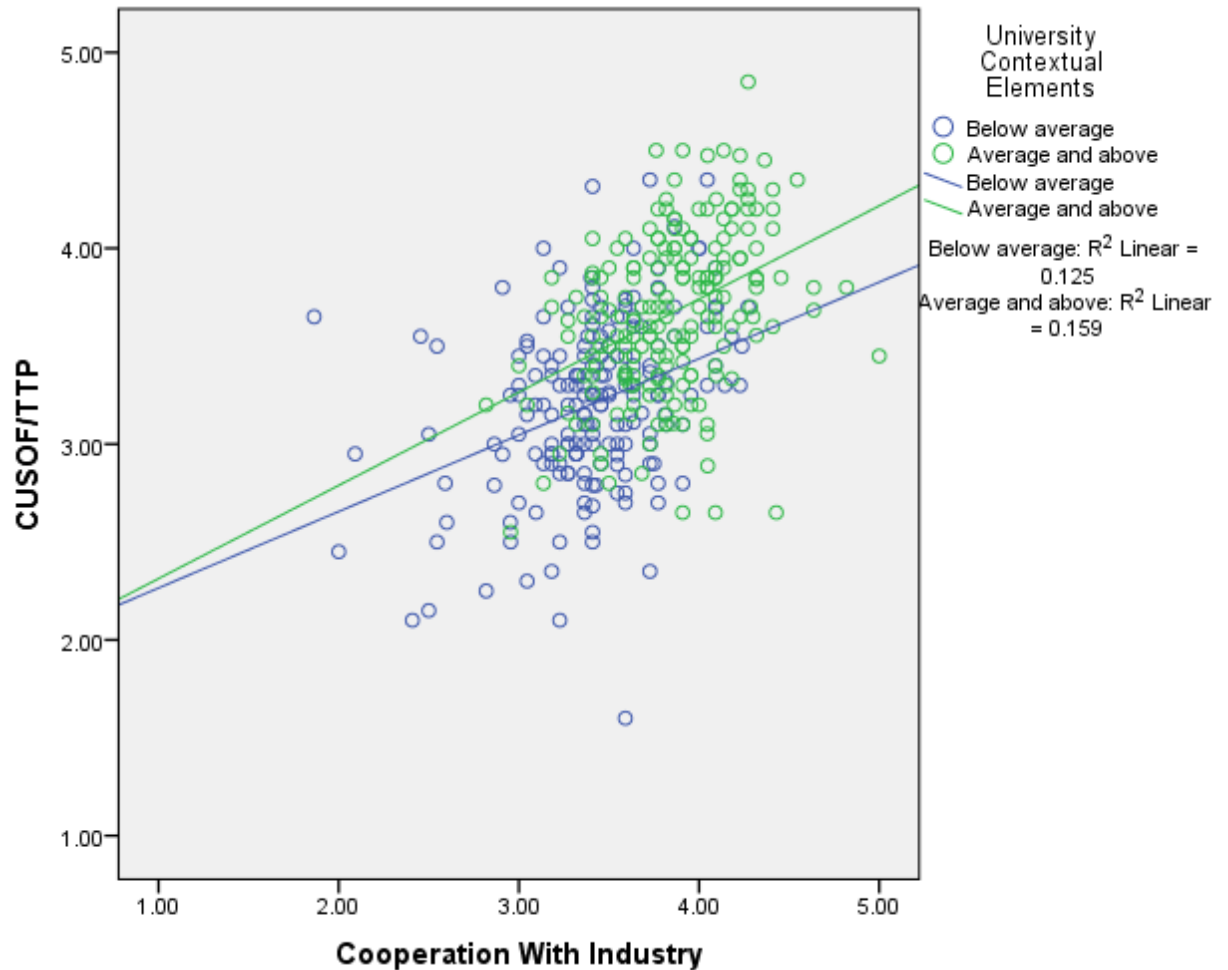
Model		Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.	Collinearity Statistics	
		B	Std. Error				Tolerance	VIF
6m	(Constant)	3.447	.021		161.863	.000		
7	CWI	.590	.049	.528	12.116	.000	1.000	1.000
6m	(Constant)	3.447	.020		175.665	.000		
8	CWI	.286	.058	.256	4.939	.000	.600	1.668
	UCE	.324	.039	.430	8.285	.000	.600	1.668
6m	(Constant)	3.428	.022		152.684	.000		
9	CWI	.299	.058	.267	5.122	.000	.590	1.694
	UCE	.321	.039	.426	8.241	.000	.599	1.670
	CWI*UC	.104	.061	.068	1.693	.091	.982	1.019

E

- Predictors: (Constant), Co-operation With Industry (CWI),
- Predictors: (Constant), Co-operation With Industry (CWI), University Contextual Elements (UCE)
- Predictors: (Constant), Co-operation With Industry (CWI), University Contextual Elements (UCE) , Co-operation With Industry \*University Contextual Elements (UCE) (CWI\*UCE),
- Dependent Variable: Creation of university Spin-Off Firms/Technology Transfer process (CUSOF/TTP)

Figure 4.14 presents the interaction between UCE as the moderating variable in the relationship between CWI and CUSOF/TTP in Kenya. The results indicate a slight change from the tendencies that were earlier indicated with ESE and PPN. Both the academics with below average, average and above UCE but had minimal CWI had almost similar rate of university spin-off firm's disposition.

However, the gaps between the two groups started to widen up with increase in both CUSOF/TTP and CWI with the average and above average team maintaining the lead making UCE, the best moderator for CWI and CUSOF/TTP. This findings from the moderated regression analysis also show that UCE has a significant moderating effect on the CWI with CUSOF/TTP.



**Figure 4. 14 Moderating effect of university contextual elements on regression of co-operation with industry on creation of spin-off firms in Kenya.**

**Discussion of findings on the moderating effect of University Contextual Elements (UCE) on the regression of Co-operation With Industry (CWI) on Creation of Spin-off Firms in Kenya (CUSOF/TTP).**

The study hypothesized the null hypothesis and stated that university contextual elements (UCE) has no significant moderating effect on the relationship between co-operation with industry (CWI) and the creation of university spin-off firms in Kenya (CUSOF/TTP), the findings confirmed that the relationship between CWI (independent) and CUSOF/TTP with UCE (moderator) as the predictor was significant ( $F(2, 379) = 120.781, p < 0.001$ ).

It was noted that upon adding UCE to the model the relationship was still significant ( $\Delta R^2=0.111$ ,  $\Delta F =68.635$ ,  $p<0.001$ ), ( $\beta =0.430$ ,  $t=8.285$ ,  $p<0.001$ ). Further empirical findings showed that the relationship between with CWI (independent) and CUSOF/TTP with UCE (moderator) as the predictor when CWI\*UCE (interaction term) was added is significant ( $F(3, 378) =81.872$ ,  $p<0.001$ ). The results indicated that upon adding the interaction term to model, the  $R^2$  and  $F$  changes were significant respectively ( $\Delta R^2=0.005$ ,  $\Delta F =2.865$ ,  $p=0.091$ ).  $\beta$ , co-efficient for CWI\*UCE as a predictor was significant, ( $\beta =0.068$ ,  $t=1.693$ ,  $p=0.091$ ), meaning that 1 unit increase in OIR index led to 0.068 units increase in CUSOF/TTP giving it a good predictive value to the regression model. This imply that UCE significantly moderates the relationship between CWI and CUSOF/TTP.

#### **4.4.7.6 Regression results on the moderating effect of University Contextual Elements on the regression of Academic Entrepreneurial Intentions and the Creation of University Spin-off firms in Kenya.**

This section presents;

*Hypothesis H<sub>06d</sub>: University contextual elements have no significant moderating effect on the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya.*

In order to test the moderating effect of UCE on regression of combined AEI on CUSOF/TTP, three (3) regression models were examined. The variables were entered step by step that is ESE, PPN and CWI (independent) began the process , followed by UCE (moderator) as the predictor and finally the ESE\*UCE, PPN\*UCE and CWI\*UCE (interaction terms) were entered sequentially.

The models were fitted;

$$\text{Model } 6m_{10} \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

$$\text{Model } 6m_{11} \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_Z Z_2 + \varepsilon$$

$$\text{Model } 6m_{12} \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_Z Z_2 + \beta_{Z1} X_1 Z_2 + \beta_{Z2} X_2 Z_2 + \beta_{Z3} X_3 Z_2 + \varepsilon$$

**Where**             $Y$  - CUSOF/TTP

$\beta_0$  - Constant

$\beta_1$  - Co-efficient 1,

$\beta_2$  - Coefficient 2,

$\beta_3$  - Coefficient 3

$X_1$  - ESE

$X_2$  - PPN

$X_3$  - CWI

$Z_2$  - UCE (predictor),

$\varepsilon$  - Error term

Results in Table 4.36 presents model 6m<sub>10</sub> with ESE, PPN and CWI as independent variables. The model shows that relationship between combined ESE, PPN and CWI and CUSOF/TTP is significant (F (3, 377) =83.684, p<0.001) and ( $\Delta R^2 = 0.400$ ,  $\Delta F=83.684$ , p<0.001). Not to mention, the  $\beta$  co-efficient for ESE, PPN and CWI was significant ( $\beta =0.109$ , t=2.438, p=0.015;  $\beta =0.366$ , t=7.375, p<0.001;  $\beta =0.288$ , t=5.977, p<0.001) respectively.

Hence, the model equation for combined AIE (ESE, PPN and CWI) was;

$$\text{Model 6m}_{10} Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

$$\text{CUSOF/TTP}=3.450+0.101\text{ESE}+0.303\text{PPN}+0.321\text{CWI}$$

Likewise, model 6m<sub>11</sub> indicates that the relationship between joined ESE, PPN and CWI (independent variables) and OIR (moderator) as the predictor was significant (F (4, 376) =73.643, p<0.001). When UCE was included in the model the relationship is also significant ( $\Delta R^2=0.040$ ,  $\Delta F =26.522$ , p=0.006) showing UCE is a significant predictor between a combined AEI and CUSOF/TTP. Additionally,  $\beta$  co-efficient for UCE as a predictor was significant ( $\beta =0.282$ , t=5.150, p<0.001), meaning that 1 unit increase in UCE, increased CUSOF/TTP by about 0.282 units. The findings confirm that UCE is significant in the relationship between joined AEI and CUSOF/TTP.

Therefore, the model equation for a combined AEI and OIR was;

$$\text{Model 6m}_{11} Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 Z_2 + \varepsilon$$

$$\text{CUSOF/TTP}=3.449+0.069\text{ESE}+0.227\text{PPN} + 0.191\text{CWI}+ 0.213\text{UCE}$$

Over and above, model 6m<sub>12</sub> shows that the relationship was significant between joined AIE (ESE, PPN and CWI as independent variables), UCE (moderator) as the predictor on one hand and when ESE\*UCE, PPN\*UCE and CWI\*UCE (interaction terms) were added on the other hand (F (7, 373) =45.002, p<0.001).

In addition, the empirical results shows when the interaction terms were added to model, both the changes in R<sup>2</sup> and in F were significant ( Δ R<sup>2</sup> = 0.019, Δ F =4.261, p=0.06).

$\beta$ , co-efficient for ESE\*OIR, PPN\*OIR and CWI\*OIR as a predictor were significant, significant and not significant respectively ( $\beta$  =0.089, t=1.976, p=0.049;  $\beta$  =0.117, t=2.380, p=0.018;  $\beta$  =-0.073, t=-1.422, p=0.156). This imply that UCE is not significant when moderating the relationship CWI and CUSOF/TTP but significant when moderating the one with ESE and PPN.

The model equation for joined AIE (independent variables), UCE (moderator/predictor), ESE\*UCE, PPN\*UCE and CWI\*UCE (interaction terms).

$$\text{Model 6m}_{12} \quad Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_Z Z_2 + \beta_{Z1} X_1 Z_2 + \beta_{Z2} X_2 Z_2 + \beta_{Z3} X_3 Z_2 + \varepsilon$$

$$\text{CUSOF/TTP} = 3.422 + 0.074 \text{ESE} + 0.233 \text{PPN} + 0.162 \text{CWI} +$$

$$0.208 \text{UCE} + 0.129 \text{ESE*UCE} + 0.129 \text{PPN*UCE} - 0.111 \text{CWI*UCE}$$

In conclusion, the findings confirm that UCE is significant in the relationship between joined AIE and CUSOF/TTP and hence null hypothesis, H<sub>04d</sub> is therefore rejected.

**Table 4. 36 Regression results on the moderating effect of University Contextual Elements (UCE) on the regression of Academic Entrepreneurial Intentions (AEI) and the Creation of University Spin-off firms in Kenya (CUSOF/TTP).**

<b>Model Summary</b>									
<b>Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>	<b>Change Statistics R Square Change</b>	<b>F Change</b>	<b>df 1</b>	<b>df2</b>	<b>Sig. F Change</b>
6m <sub>10</sub>	.632 <sup>a</sup>	.400	.395	.37869	.400	83.684	3	37	.000
6m <sub>11</sub>	.663 <sup>b</sup>	.439	.433	.36649	.040	26.522	1	37	.000
6m <sub>12</sub>	.677 <sup>c</sup>	.458	.448	.36181	.019	4.261	3	37	.006

<b>ANOVA</b>						
<b>Model</b>		<b>Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
6m <sub>10</sub>	Regression	36.002	3	12.001	83.684	.000 <sup>a</sup>
	Residual	54.064	377	.143		
	Total	90.067	380			
6m <sub>11</sub>	Regression	39.565	4	9.891	73.643	.000 <sup>b</sup>
	Residual	50.502	376	.134		
	Total	90.067	380			
6m <sub>12</sub>	Regression	41.238	7	5.891	45.002	.000 <sup>c</sup>
	Residual	48.828	373	.131		
	Total	90.067	380			

<b>Co-efficients</b>								
<b>Model</b>		<b>Unstandardized Coefficients</b>		<b>Standardized Coefficients</b>	<b>t</b>	<b>Sig.</b>	<b>Collinearity Statistics</b>	
		<b>B</b>	<b>Std. Error</b>	<b>Beta</b>			<b>Tolerance</b>	<b>VIF</b>
6m <sub>0</sub>	(Constant)	3.450	.019		177.821	.000		
	ESE	.101	.041	.109	2.438	.015	.793	1.261
	PPN	.303	.041	.366	7.375	.000	.648	1.544
	CWI	.321	.054	.288	5.977	.000	.685	1.460
6m <sub>1</sub>	(Constant)	3.449	.019		183.682	.000		
	ESE	.069	.041	.075	1.711	.088	.775	1.290
	PPN	.227	.042	.274	5.357	.000	.570	1.756
	CWI	.191	.058	.172	3.312	.001	.555	1.803
	UCE	.213	.041	.282	5.150	.000	.496	2.017
6m <sub>2</sub>	(Constant)	3.422	.022		156.311	.000		
	ESE	.074	.042	.080	1.774	.077	.709	1.411
	PPN	.233	.042	.281	5.497	.000	.555	1.800
	CWI	.162	.059	.146	2.750	.006	.519	1.926

UC	.208	.041	.276	5.046	.000	.487	2.051
ESE*UC	.129	.066	.089	1.976	.049	.710	1.408
E							
PPN*UC	.129	.054	.117	2.380	.018	.603	1.659
E							
CWI*UC	-.111	.078	-.073	-1.422	.156	.545	1.834
E							

a. Predictors: (Constant), Co-operation With Industry (**CWI**), Entrepreneurial Self Efficacy (**ESE**), Personal and Professional Networks , (**PPN**)

b. Predictors: (Constant), Co-operation With Industry (**CWI**), Entrepreneurial Self Efficacy (**ESE**), Personal and Professional Networks (**PPN**), University Contextual Elements (UCE) (**UCE**),

d. Predictors: (Constant), Co-operation With Industry (**CWI**), Entrepreneurial Self Efficacy (**ESE**), Personal and Professional Networks (**PPN**), University Contextual Elements (UCE) (**UCE**),  
Co-operation With Industry\* University Contextual Elements (UCE), (**CWI\*UCE**),  
Entrepreneurial Self Efficacy\*University Contextual Elements (UCE) (**ESE\*UCE**),  
Personal and Professional Networks\*University Contextual Elements (UCE), (**PPN\*UCE**)

c. Dependent Variable: Creation of university Spin-Off Firms/Technology Transfer process (**CUSOF/TTP**)

**Discussion of findings on the moderating effect of University Contextual Elements (UCE) on the regression of Academic Entrepreneurial Intentions (AEI) and the Creation of University Spin-off firms in Kenya (CUSOF/TTP).**

The research study hypothesized that university contextual elements has no significant moderating effect on the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya. However the empirical findings confirmed that there is a relationship between joined AEI (independent variables) and CUSOF/TTP with UCE (moderator) as the predictor was significant ( $F(4, 376) = 73.643, p < 0.001$ ). Notably, upon adding UCE to the model the relationship was still significant ( $\Delta R^2 = 0.040, \Delta F = 26.522, p < 0.001$ ), ( $\beta = 0.282, t = 5.510, p < 0.001$ ). Further empirical findings showed that the relationship between with AEI (independent) and CUSOF/TTP



with UCE (moderator) as the predictor when AEI\*UCE (interaction term) was added is significant ( $F(7, 373) = 45.002, p < 0.001$ ). The results indicated that upon adding the interaction term to model, the  $R^2$  and  $F$  changes were significant respectively ( $\Delta R^2 = 0.019, \Delta F = 4.261, p = 0.006$ ).  $\beta$ , co-efficient for AEI\*UCE as a predictor was significant, ( $\beta = 0.276, t = 5.046, p < 0.001$ ), meaning that 1 unit increase in UCE index led to 0.276 units increase in CUSOF/TTP giving it a good predictive value to the regression model. This implies that UCE significantly moderates the relationship between AEI and CUSOF/TTP.

In summary, Table 4.37 shows that the six hypotheses  $H_{05a}, H_{05b}, H_{05c}, H_{05d}, H_{06a}$ , and  $H_{06b}$ , were all rejected. This meant that opportunity identification and recognition had significant moderating effects on the relationship of all the individual independent variables; entrepreneurial self-efficacy, personal and professional networks and co-operation with industry and the creation of spin-off firms in Kenya. But notably, also on the relationship of joint academic entrepreneurial intentions and creation of spin-off firms. On the other hand university contextual elements had significant moderating effect on the relationship between entrepreneurial self-efficacy and personal and professional networks but no significance on co-operation with industry and joint academic entrepreneurial intentions and creation of spin-off firms in Kenya.

**Table 4. 37 Summary of the hypotheses tested under the dual moderating effects**

No	Variable	$\Delta F$	<i>P</i> -value	Direction	Deduction
H <sub>05a</sub>	OIR*ESE and CUSOF/TTP	14.517	<0.001	Positive	Reject H <sub>05a</sub>
H <sub>05b</sub>	OIR* PPN and CUSOF/TTP	16.952	<0.001	Positive	Reject H <sub>05b</sub>
H <sub>05c</sub>	OIR*CWI and CUSOF/TTP	9.014	0.003	Positive	Reject H <sub>05c</sub>
H <sub>05d</sub>	OIR*AIE and CUSOF/TTP	4.790	0.003	Positive	Reject H <sub>05d</sub>
H <sub>06a</sub>	UCE*ESE and CUSOF/TTP	10.868	0.001	Positive	Reject H <sub>06a</sub>
H <sub>06b</sub>	UCE*PPN and CUSOF/TTP	10.127	0.002	Positive	Reject H <sub>06b</sub>
H <sub>06c</sub>	UCE* CWI and CUSOF/TTP	2.865	0.091	Positive	Fail to Reject H <sub>06c</sub>
H <sub>06d</sub>	UCE*AIE and CUSOF/TTP	4.261	0.006	Positive	Fail to Reject H <sub>06d</sub>

#### 4.5 Summary of study variable analysis

This chapter discussed the findings and analysis of the data collected. The information gathered from the analyzed data confirmed that academic entrepreneurial intentions influence creation of spin-off firms in Kenya. The next chapter captures the summary, conclusion and recommendations made from the analyzed data.

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSION AND RECOMMENDATIONS**

#### **5.1 Introduction**

This chapter presents the summary of the research findings that were guided by the specific objectives, conclusions that were drawn, the recommendations that were given and the suggested areas of further research provided. The study had a general objective and six specific objectives that led to formulation of six main hypotheses and six sub-hypothesis.

#### **5.2 Summary of major findings**

The main objective of the study was to examine the academic entrepreneurial intentions and the creation of university spin-off firms in Kenya. In particular, the study sought to establish how entrepreneurial self-efficacy influences the formation of university spin-off firms in Kenya, to determine how academics personal and professional networks influences the creation of university spin-off firms in Kenya, to investigate how cooperation with the industry promotes the creation of university spin-off firms in Kenya. In addition, the study sought to establish how opportunity identification and recognition moderate the relationship between academic entrepreneurial intentions and the formation of university spin-off firms in Kenya and finally to investigate how university contextual elements moderates the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya.

### **5.2.1 Influence of entrepreneurial self- efficiency on the creation of university spin-off firms in Kenya.**

The first specific objective was to establish the influence of entrepreneurial self-efficacy (ESE) on the creation of university spin-off firms (CUSOF) in Kenya. From this objective, it was hypothesized that ESE has no significant influence on the CUSOF in Kenya. However, the results showed that a positive statistically significant relationship existed between the two with ESE explaining 13.4% of CUSOF/TTP leaving 86.6% by other factors outside the model meaning that academics with stronger ESE had stronger intention to CUSOF/TTP. The findings provided empirical evidence that starting one's business is often described as a purposive and intentional career choice that is driven by both intrinsic and extrinsic factors. In the sense that academic motives, expectations and perceptions towards commercialization are very important. They include individual knowledge and skills, industrial experience, and personal attitudes. While on other hand recognition among peers, promotion at the university, monetary reward, availing resources or funding or through encouragement to increase productivity through publications and patents are also important in making that entrepreneurial choice.

### **5.2.2 Influence of Personal and professional networks on the creation of university spin-off firms.**

The second specific objective was to determine the influence of personal and professional networks (PPN) on the creation of university spin-off firms (CUSOF) in Kenya. Although, the study hypothesized that PPN has no significant influence on CUSOF in Kenya, the empirical findings indicated that a positive statistically significant relationship existed between the two with PPN explaining 32.8 % of CUSOF/TTP leaving the

difference of 67.2% described by other factors outside the model. Launching a new venture is a social process, because the entrepreneur is at the interaction with other people in the society while gathering the required resources so as to find the opportunity. Also, the social environment, from the point of sociopsychological context, has important effect on the motivation, perception and attitude of the individual. Thus, the research provided further support to the common perception that academic entrepreneurs with many contacts and greater accumulated resources and support from these contacts are better able to launch new ventures. Therefore, the results confirmed direct relationships between social networks and new venture creation where by having many networks connections facilitates the building of new ventures.

### **5.2.3 Influence of Co-operation With Industry on the creation of university spin-off firms in Kenya.**

The third specific objective was to investigate the influence of co-operation with industry on the creation of university spin-off firms in Kenya. Despite the fact that the study hypothesized that co-operation with the industry has no significant influence on the creation of university spin-off firms in Kenya, the results rejected the null hypothesis restating that there is a positive statistical significance between the two variables with CWI explaining 27.1 % of CUSOF/TTP leaving the difference of 72.9 % described by other factors outside the model. The results showed that in order for university and industry to establish and sustain collaboration, they must gain mutual benefit from the interactions. The two main benefits from a university perspective of collaborative research with industrial partners were technological and financial. Under technological collaborations, universities seek for increased access to proprietary technology held by industry that facilitates the discovery process. While

under financial collaborations, universities pursue access to sources of research funding in addition to their traditional public sources. This empirical findings confirm that university-industry relations enables high learnings institutions with closer connections to industry produce a greater number of spin-offs and show more entrepreneurial activities.

#### **5.2.4 Influence of joint academic entrepreneurial intentions on the creation of university spin-off firms in Kenya.**

This fourth objective was meant to investigate the extent to which the joint academic entrepreneurial intentions (AIE) influence the creation of university spin off firms. It was hypothesized that there is no significant relationship between AIE and CUSOF/TTP. However, the research findings confirmed that there is a positive statistical significant relationship between AIE and CUSOF/TTP with AEI explaining 40.1% of CUSOF/TTP leaving out difference of 59.9% being influenced by other factors outside the model. It was noted that the combined effect was fairly great than effect individual influence of ESE, PPN and CWI. This results clearly explain that majority of the academics wanted to take entrepreneurship as a career for that it was pathway to personal growth but larger economic development must importantly they had individual placed measures in place to start and manage their business. In addition, both personal and environmental factors influence academics decision to become entrepreneur. Whereas entrepreneurial self-efficacy enhances their attitudes to have positive outcome in venture creation, personal and professional networks and co-operation with industry addresses the perceived social pressure to for individual academic and the larger institution to reach out and build internal and external strategic alliances that are of mutual benefits.

### **5.2.5 Influence of moderating effect of opportunity identification and recognition on the relationship between academic entrepreneurial intentions and the creation of university of university spin-off firms in Kenya**

The fifth specific objective was to establish the influence of moderating effect of opportunity identification and recognition on the relationship between academic entrepreneurial intentions and the formation of university spin-off firms in Kenya. This objective was tested under three hypotheses as follows:

*Hypothesis H<sub>05a</sub>: Opportunity identification and recognition have no significant moderating effect on the relationship between entrepreneurial self-efficacy and the creation of university spin-off firms in Kenya.*

The results showed a positive significant relationship between ESE (independent) and CUSOF/TTP with OIR (moderator) as the predictor raising from 13.1 % to 14.1 %. Even with introduction of interaction effect, OIR\*ESE the relationship remained significant predictor between ESE and CUSOF/TTP improving by a further 3.2%. Since entrepreneurial self-efficacy is the strength of an academic's belief that he or she is capable of successfully performing the roles and tasks of an entrepreneur, then entrepreneurial environment could be analyzed to be having immense opportunities by people with high ESE but perceived as being costlier and riskier by people with low ESE. This is because with availability of opportunities, people with high ESE will attain positive outcome whereas people with low ESE will deduce negative outcome.

*Hypothesis H<sub>05b</sub> Opportunity identification and recognition have no significant moderating effect on the relationship between personal and*

*professional networks and the creation of university spin-off firms  
in Kenya.*

Although, the study hypothesized that OIR has no significant moderating effect on the relationship between PPN and the CUSOF/TTP in Kenya, the findings rejected that and instead affirmed that there is a positive significant relationship between PPN (independent) and CUSOF/TTP with OIR (moderator) as the predictor. With introduction of OIR, the relationship was enhanced from 32.3% to 34.6%. Moreover with inclusion of the interaction effect, OIR\*PPN the association was boosted 2.8%. This results showed intense engagement either with family and friends or business and professional led to the academic to discover more opportunities and deliver value to the market. In addition the search for knowledge about markets, technologies and consumer needs contributed strongly to them forming positive attitudes toward entrepreneurship and gaining relevant skills.

***Hypothesis H<sub>05c</sub>:*** *Opportunity identification and recognition have no significant moderating effect on the relationship between co-operation with industry and the creation of university spin-off firms in Kenya.*

The research study hypothesized that OIR has no significant moderating effect on the relationship between CWI and CUSOF/TTP. With introduction of OIR, the relationship was enhanced from 27.9% to 31.1%. Moreover with inclusion of the interaction effect, OIR\*CWI the association was boosted 1.6%. The result confirm that university and industry collaboration are enhanced with availability of opportunities that are not only for knowledge creation and contribution to economic development but for mutual benefit from the interactions. Therefore this supports the argument that university–industry



partnership enables the university to fulfill its entrepreneurship role, also known as the third mission. For instance in Kenya, it has led to establishment of science parks business incubators, technology transfer offices that provide better engagement of academics in knowledge transfer activities, recognize commercial opportunities of research activities and entrench entrepreneurial culture across the higher learning institutions.

***Hypothesis H<sub>05a</sub>:*** *Opportunity identification and recognition have no significant moderating effect on the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya*

The study hypothesized that OIR has no significant moderating effect on the relationship between AEI and CUSOF/TTP. With introduction of OIR, the relationship was enhanced from 40% to 40.5%. Moreover with inclusion of the interaction effect, OIR\*AEI the association was boosted by 2.2% although lower than individual ESE that improved with by 3.2%. The results confirm that when both individual and situational factors work together then they provide a higher entrepreneurial intent which in effect bolsters the creation of spin-of firms. From the results it is reported that OIR acted a better moderator in relationship between CWI and CUSOF/TTP than ESE and PPN. Therefore the result support the other study findings that university and industry collaboration are enhanced with availability of opportunities that are not only for knowledge creation and contribution to economic development but for mutual benefit from the interactions. However with introduction of various interaction terms, OIR\*ESE had the highest improvement of 3.2 % supporting the assertion that whereas extrinsic factors play a

significant role in entrepreneurial decisions, entrepreneurial self-efficacy remains the most significant.

### **5.2.6 Influence of moderating effect of university contextual elements on the relationship between academic entrepreneurial intentions and the creation of university of university spin-off firms in Kenya**

The sixth specific objective was to investigate the influence of university contextual elements on the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya. This objective was tested under three hypothesis as follows:

**Hypothesis H<sub>06a</sub>:** *University contextual elements have no significant moderating effect on the relationship between entrepreneurial self-efficacy and the creation of university spin-off firms in Kenya.*

The results showed a positive significant relationship between ESE (independent) and CUSOF/TTP with UCE (moderator) as the predictor raising from 13.1 % to 36.9 % posting a greater improvement than OIR in **H<sub>05a</sub>**. Although with introduction of interaction effect, OIR\*UCE the relationship remained significant predictor between ESE and CUSOF/TTP improving by a further 1.8% but less than **H<sub>05a</sub>** that improved by 3.2%. This meant that as much as OIR was important, UCE played a bigger moderating role in relationship between ESE and CUSOF/TTP in the sense that contextual factors that included social, economic, political, infrastructure development and market emergence played a very crucial role in enhancing the individual and professional networks. On the other hand, universities should provide sufficient incentives and rewards for academics

and ensure that policies that govern research activities inspire and encourage researchers to generate outputs from their research results.

***Hypothesis H<sub>06b</sub>:*** *University contextual elements have no significant moderating effect on the relationship between personal and professional networks and the creation of university spin-off firms in Kenya.*

The study hypothesized that UCE has no significant moderating effect on the relationship between PPN and the CUSOF/TTP in Kenya, the findings rejected that and instead affirmed that there is a positive significant relationship between PPN (independent) and CUSOF/TTP with UCE (moderator) as the predictor. With introduction of UCE, the relationship was enhanced from 32.3% to 41.7% posting a better moderating effect than OIR in ***H<sub>05b</sub>***. Although with inclusion of the interaction effect, UCE\*PPN the association was boasted to 1.5 %, but it was less than ***H<sub>05b</sub>*** that improved by 2.8%. This meant that as much as OIR was important, UCE played a bigger moderating role in relationship between PPN and CUSOF/TTP in the sense that availability of good environment and facilities that support new entrepreneurial innovations and venture creation within the university enhanced academics abilities to start and manage businesses. This is because the academics business and professional networks allowed access to business-related information and resources that play important role to venture creation.

***Hypothesis H<sub>06c</sub>:*** *University contextual elements have no significant moderating effect on the relationship between co-operation with industry and the creation of university spin-off firms in Kenya.*

The study hypothesized that UCE has no significant moderating effect on the relationship between CWI and CUSOF/TTP. The findings rejected that and instead affirmed that there is a positive significant relationship between CWI (independent) and CUSOF/TTP with UCE (moderator) as the predictor. With introduction of UCE, the relationship was enhanced from 27.9% to 38.9% giving a better moderating effect than  $H_{05c}$ . Although with inclusion of the interaction effect, UCE\*CWI the association was insignificant but was boosted by 0.5% that was less than  $H_{05c}$  that improved by 1.6 %. This meant that as much as OIR was important, UCE played a bigger moderating role in relationship between CWI and CUSOF/TTP in the sense that increase in the index for co-operation with industry was a result of improved university contextual elements that ensured that the academics are able to engage at formal, informal and non-formal level within and outside the universities.

***Hypothesis H<sub>06d</sub>:*** *University contextual elements have no significant moderating effect on the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya.*

The study hypothesized that UCE has no significant moderating effect on the relationship between AEI and the CUSOF/TTP in Kenya, the findings rejected that and instead affirmed that there is a positive significant relationship between AEI (independent) and CUSOF/TTP . With introduction of UCE, the relationship was enhanced from 40% to 43.9% giving a better moderating effect than  $H_{06d}$ . Although with inclusion of the interaction effect, UCE\*AEI the association was insignificant but was boosted by 1.9 % that was less than  $H_{05d}$  that improved by 2.2 %. This meant that as much as OIR was important, UCE played a bigger moderating role in relationship between AIE and

CUSOF/TTP in the sense that when both personal and contextual factors work together then they provide a higher entrepreneurial intent which in effect bolsters the creation of spin-off firms. When the university contextual elements were included it brought a better output than when entrepreneurial self-efficacy, personal and professional networks and cooperation with industry were individually added. From the results it is reported that UCE acted as a better moderator in relationship between ESE and CUSOF/TTP than PPN and CWI. However with introduction of various interaction terms, UCE\*ESE had the highest improvement of 1.8 % supporting the assertion that whereas external elements play a key role in entrepreneurial decisions, entrepreneurial self-efficacy remains the most significant. Therefore the results support the other study findings that academic attitude, expectations and perceptions towards technology transfer is very important and it guides his/her entrepreneurial choices at all times.

### **5.3 Conclusion**

#### **5.3.1 Influence of entrepreneurial self-efficacy on the creation of university spin-off firms in Kenya.**

The study concluded that there was a positive statistically significant relationship that existed between entrepreneurial self-efficacy and creation of spin-off firms in Kenya. Developing entrepreneurial self-efficacy attributes among the university community is a progressive process that requires active participation of both the university managers, academic staff and students. Therefore it is advised that for universities to become entrepreneurially competent they should work towards developing a conducive environment and promoting policies that are entrepreneurially friendly that will allow all academics to identify, evaluate and develop their opportunities into fully fledged business enterprises.

### **5.3.2 Influence of personal and professional networks on the creation of university spin-off firms in Kenya.**

Similarly, the study concludes that there is positive statistically significant relationship between personal and professional networks and creation of spin off firms in Kenya. These findings could be urging policy makers in universities and government authorities that are seeking to promote the emergence of entrepreneurial activities in the academic world, to foster effective entrepreneurial networks for academics early in their careers. They encourage the establishing of both personal networks (family, friends and colleagues) and professional networks (mentors, business networks and professional forums) access to business-related information, resources and positive recommendations that will encourage them to start and grow their new ventures.

### **5.3.3 Influence of cooperation with the industry on the creation of university spin-off firms in Kenya.**

Equivalently, the researcher concludes that cooperation with the industry and creation of university spin-off firms in Kenya have a positive significant relationship. The research findings posit that both universities and industry should establish and sustain collaborations that will bring gain mutual benefit amongst themselves. For universities perspective, they should association that bring technological and financial partnership that will cascade into strategic and educational and political collaborations.

### **5.3.4 Influence of joint academic entrepreneurial intentions on the creation of university spin-off firms in Kenya.**

Therefore the research study concluded that the joint academic entrepreneurial intentions and creation of spin of university spin-off firms have apposite relationship. The

researcher observed that both personal and non-personal factors contributes to the starting and managing successful business ventures.

**5.3.5 Influence of moderating effect of opportunity identification and recognition on the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya.**

The study further concludes that opportunity identification and recognition significantly moderates between academic entrepreneurial intentions and corresponds to the principal activities that take place before a business is formed or structured. Since, identifying and selecting the right opportunities for new businesses are among the most important abilities of a successful entrepreneur, all academic should the able to understand the process of discovering and developing the opportunities into business ventures noting the key hindrances at each stages that may prevent the smooth progression to the next phases.

**5.3.6 Influence of moderating effect of university contextual elements on the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya.**

The study also concludes that university contextual elements moderates the relationship between academic entrepreneurial intentions and the creation of university spin-off firms in Kenya. The study observed that beyond the individual attributed, environmental factors like economic, political and cultural climate, administrative complexities, physical and institutional infrastructure have substantial impact on the abilities of an academic to develop and nurture their intentions that lead to creation of spin-off firms. Therefore the

government and policy makers should ensure that it provide necessary support the growth and development of academic entrepreneurship at the universities.

#### **5.4 Recommendations**

1. Based on the findings of the study, the researcher recommends that the universities should develop and sustain entrepreneurial self-efficacy among academics. Empirical findings from this study indicate that entrepreneurial self-efficacy remain at the heart of entrepreneurial decisions and therefore all efforts should nurture and develop this attributes from the informal to formal institutions, from local, county and national levels until entrepreneurship become the national 'culture'.
2. Similarly, based on the findings on the study, the researcher recommends academics to combine building both informal and formal ties because it maximizes their entrepreneurial efforts, as professional resources get exchanged in personal encounters. These benefits, in turn, may strengthen their sense of control over their potential to achieve success as entrepreneurs and at the same time maintaining their close family systems.
3. In addition, the researcher from the study recommends that universities and industry work together in order to achieve their combined technological, financial, political, strategic, educational and motivations goals. The findings confirm that the major collaborations agenda of technological and financial objectives should vigorously be pursued by universities to ensure all research outputs are commercialized timely and profitably.



4. With regard to the relationship between joint entrepreneurial intentions and creation of university spin-off firms in Kenya, the research recommends that the universities should both harness individual abilities of the academic and at the same time develop enabling environment for greater success to be achieved meaning that individual with entrepreneurial characteristics, abilities, and perceptions must find himself or herself in an environment conducive for entrepreneurial activities.
5. Furthermore, the researcher recommends that any recognition of opportunity by a prospective entrepreneur should- preceded by a state of heightened alertness to information. Higher alertness increases the likelihood of an opportunity being recognized and hence new venture created. This should be done by strengthening the informal and formal ties of social network.
6. Finally the researcher recommends that university contextual elements maintain excellence in research and should create more successful universities that have clearer strategies towards the spinning out of companies and the use of surrogate entrepreneurs in this process.

### **5.5 Areas of further research**

Although these results bring us closer to the reality of the phenomenon of academic entrepreneurial intentions and the concept of creation of university spin-off firms, its complexity is focused as a research issue. There is need for a deeper dissection to obtain more information to help further understand the rationale of these intentions and to identify the factors that contribute to their expression and hence realization. Undoubtedly, the study provides considerable information and a patterns of desirable expectations that

individual academics and their respective universities in their quest to commercialize knowledge originating their researches. Whilst commercialization clearly represents an important way for academic research to contribute to economy and society, there are multiple other ways in which university research can be transferred e.g. licensing of university patents, intellectual property and more importantly academic engagement, - 'knowledge-related collaboration by academic researchers with non-academic organizations'. Empirical research need to be conducted to establish the nature and importance of the formal and non-formal activities involved in academic engagement that are considered to be significantly more valuable than the rest.

## REFERENCES

- Ab Aziz, K., Harris, H., & Norhashim, M. (2011). University research, development & commercialisation management: a Malaysian best practice case study. *World Review of Business Research*, 1(2), 179-192.
- Abramo, G., D'Angelo, C. A., & Di Costa, F. (2011). University-industry research collaboration: a model to assess university capability. *Higher Education*, 62(2), 163-181.
- Adoyo, C. A. (2015). *Factors influencing research outputs in Kenya: The case of selected public universities*. (Master's thesis), University of Nairobi, Unpublished. Retrieved from <http://erepository.uonbi.ac.ke/handle/11295/89865>
- Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 50(2), 179-211.
- Ajzen, I. (2005). *Attitudes, personality, and behavior*. London: McGraw-Hill Education
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behaviour*. London: Prentice-Hall.
- Akuegwu, B., & Nwi-ue, F. (2016). Developing Entrepreneurship Culture among University Students in South-South, Nigeria. *Mediterranean Journal of Social Sciences*, 7(2 S1), 315.
- Alvarez, S. A., & Barney, J. B. (2007). Discovery and creation: Alternative theories of entrepreneurial action. *Strategic Entrepreneurship Journal*, 1(1-2), 11-26.
- Ardichvili, A., Cardozo, R., & Ray, S. (2003). A theory of entrepreneurial opportunity identification and development. *Journal of Business Venturing*, 18(1), 105-123.
- Arvanitis, S., Kubli, U., & Woerter, M. (2008). University-industry knowledge and technology transfer in Switzerland: What university scientists think about co-operation with private enterprises. *Research Policy*, 37(10), 1865-1883.
- Autio, E., Hameri, A.-P., & Nordberg, M. (1996). A framework of motivations for industry-big science collaboration: a case study. *Journal of Engineering and Technology Management*, 13(3-4), 301-314.

- Autio, E., Keeley, R., Klofsten, M., Gc Parker, G., & Hay, M. (2001). Entrepreneurial intent among students in Scandinavia and in the USA. *Enterprise and Innovation Management Studies*, 2(2), 145-160.
- Awuor, E. O. (2013). The Role of Research and Findings Dissemination in Industry Development in Kenya: The Floriculture Industry in Perspective. *European Journal of Business and Management*, 3(3).
- Ayuo, A., & Kubasu, A. (2014). Theory of Planned Behaviour, Contextual Elements, Demographic Factors and Entrepreneurial Intentions of Students in Kenya. *European Journal of Business and Management*, 6(15), 167-175.
- Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, 84(2), 191.
- Bandura, A. (1982). Self-efficacy mechanism in human agency. *American psychologist*, 37(2), 122.
- Bandura, A. (2012). *On the functional properties of perceived self-efficacy* Los Angeles: SAGE Publications
- Barbara, B., & David, A. (1989). Faculty entrepreneurship in research university environments. *The Journal of Higher Education*, 60(5), 583-596.
- BarNir, A., Watson, W. E., & Hutchins, H. M. (2011). Mediation and moderated mediation in the relationship among role models, self-efficacy, entrepreneurial career intention, and gender. *Journal of Applied Social Psychology*, 41(2), 270-297.
- Bercovitz, J., & Feldman, M. (2008). Academic entrepreneurs: Organizational change at the individual level. *Organization Science*, 19(1), 69-89.
- Bhave, M. P. (1994). A process model of entrepreneurial venture creation. *Journal of Business Venturing*, 9(3), 223-242.
- Bird, B. (1988). Implementing entrepreneurial ideas: The case for intention. *Academy of management Review*, 13(3), 442-453.
- Birley, S. (1986). The role of networks in the entrepreneurial process. *Journal of Business Venturing*, 1(1), 107-117.

- Birley, S. (2002). Universities, academics, and spinout companies: lessons from Imperial. *International Journal of Entrepreneurship Education*, 1(1), 1-21.
- Blumberg, B. F., Cooper, D. R., & Schindler, P. S. (2014). *Business research methods*. Toronto: McGraw-hill education.
- Blumenthal, D., Campbell, E. G., Causino, N., & Louis, K. S. (1996). Participation of life-science faculty in research relationships with industry. *New England Journal of Medicine*, 335(23), 1734-1739.
- Blumenthal, D., Causino, N., Campbell, E., & Louis, K. S. (1996). Relationships between academic institutions and industry in the life sciences—an industry survey. *New England Journal of Medicine*, 334(6), 368-374.
- Boyd, N. G., & Vozikis, G. S. (1994). The influence of self-efficacy on the development of entrepreneurial intentions and actions. *Entrepreneurship theory and practice*, 18(3), 63-63.
- Bozeman, B., Dietz, J. S., & Gaughan, M. (2001). Scientific and technical human capital: an alternative model for research evaluation. *international Journal of technology management*, 22(7-8), 716-740.
- Brüderl, J., & Preisendörfer, P. (1998). Network support and the success of newly founded business. *Small Business Economics*, 10(3), 213-225.
- Brundenius, C., Lundvall, B.-Å., & Sutz, J. (2009). *The Role of Universities in Innovation Systems in Developing Countries: Developmental University Systems* â€“Empirical, Analytical and Normative Perspectives. Retrieved from [https://books.google.co.ke/books?hl=en&lr=&id=AaRyLGPjkE0C&oi=fnd&pg=PA311&dq=The+Role+of+Universities+in+Innovation+Systems+in+Developing+Countries:+Developmental+University+Systems+%C3%A2%E2%82%AC%E2%80%9CEmpirical,+Analytical+and+Normative+Perspectives&ots=x4Z2Efe0qY&sig=hpO5L6RK2tzZm3dJH-DEbU\\_McY&redir\\_esc=y#v=onepage&q&f=false](https://books.google.co.ke/books?hl=en&lr=&id=AaRyLGPjkE0C&oi=fnd&pg=PA311&dq=The+Role+of+Universities+in+Innovation+Systems+in+Developing+Countries:+Developmental+University+Systems+%C3%A2%E2%82%AC%E2%80%9CEmpirical,+Analytical+and+Normative+Perspectives&ots=x4Z2Efe0qY&sig=hpO5L6RK2tzZm3dJH-DEbU_McY&redir_esc=y#v=onepage&q&f=false)
- Bruneel, J., d'Este, P., & Salter, A. (2010). Investigating the factors that diminish the barriers to university–industry collaboration. *Research Policy*, 39(7), 858-868.

- Bwisa, H. (2011). *Entrepreneurship Theory and Practice: A Kenyan Perspective*. Nairobi: Jomo Kenyatta Foundation.
- Bwisa, H., & Gachuhi, A. (1999). *An Investigation into Factors that Influence the Diffusion and Adoption of Inventions and Innovations from Research Institutes and Universities in Kenya*. Retrieved from [http://www.atpsnet.org/Files/working\\_paper\\_series\\_19.pdf](http://www.atpsnet.org/Files/working_paper_series_19.pdf)
- Bygrave, W. (1989). The entrepreneurship paradigm (I): a philosophical look at its research methodologies. *Entrepreneurship theory and practice*, 14(1), 7-26.
- Carr, J. C., & Sequeira, J. M. (2007). Prior family business exposure as intergenerational influence and entrepreneurial intent: A theory of planned behavior approach. *Journal of Business Research*, 60(10), 1090-1098.
- Chandler, G. N., & Hanks, S. H. (1994). Founder competence, the environment, and venture performance. *Entrepreneurship: Theory and Practice*, 18(3), 77-90.
- Chang, E. P., Memili, E., Chrisman, J. J., Kellermanns, F. W., & Chua, J. H. (2009). Family social capital, venture preparedness, and start-up decisions: A study of Hispanic entrepreneurs in New England. *Family Business Review*.
- Chapple, W., Lockett, A., Siegel, D., & Wright, M. (2005). Assessing the relative performance of UK university technology transfer offices: parametric and non-parametric evidence. *Research Policy*, 34(3), 369-384.
- Chell, E., & Baines, S. (2000). Networking, entrepreneurship and microbusiness behaviour. *Entrepreneurship & Regional Development*, 12(3), 195-215.
- Chen, C., Greene, P. G., & Crick, A. (1998). Does entrepreneurial self-efficacy distinguish entrepreneurs from managers? *Journal of Business Venturing*, 13(4), 295-316.
- Cohen, W. M., Florida, R., Randazzese, L., & Walsh, J. (1998). Industry and the academy: uneasy partners in the cause of technological advance *Challenges to research universities* (Vol. 171, pp. 59). New York: Brookings Institute Press
- Cooper, D. R., & Schindler, P. S. (2003). *Business research methods*. Boston: McGraw Hill.

- Corbin, J., & Strauss, A. (2008). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory* (3rd ed.). Thousand Oaks, California: Sage Publications.
- Crant, J. M. (1996). The proactive personality scale as a predictor of entrepreneurial intentions. *Management*, 29(3), 62-74.
- Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, California: Sage publications.
- Culbertson, S. S., Smith, M. R., & Leiva, P. I. (2010). Enhancing entrepreneurship: The role of goal orientation and self-efficacy. *Journal of Career Assessment*, 19(2), 59-71.
- D'Orazio, P., Monaco, E., & Palumbo, R. (2012). Determinants of Academic Entrepreneurial Intentions in Technology Transfer Process: An Empirical Test. *Available at SSRN 2079114*.
- De Carolis, D. M., Litzky, B. E., & Eddleston, K. A. (2009). Why networks enhance the progress of new venture creation: The influence of social capital and cognition. *Entrepreneurship theory and practice*, 33(2), 527-545.
- De Noble, A. F., Jung, D., & Ehrlich, S. B. (1999). Entrepreneurial self-efficacy: The development of a measure and its relationship to entrepreneurial action. *Frontiers of Entrepreneurship Research*, 1999(1), 73-87.
- Díaz-García, M. C., & Jiménez-Moreno, J. (2010). Entrepreneurial intention: the role of gender. *International Entrepreneurship and Management Journal*, 6(3), 261-283.
- Dill, D. D. (1995). University-industry entrepreneurship: the organization and management of American university technology transfer units. *Higher Education*, 29(4), 369-384.
- Djokovic, D., & Souitaris, V. (2008). Spinouts from academic institutions: a literature review with suggestions for further research. *The Journal of Technology Transfer*, 33(3), 225-247.
- Dooley, L., & Kirk, D. (2007). University-industry collaboration: Grafting the entrepreneurial paradigm onto academic structures. *European Journal of Innovation Management*, 10(3), 316-332.

- Drnovšek, M., Wincent, J., & Cardon, M. S. (2010). Entrepreneurial self-efficacy and business start-up: developing a multi-dimensional definition. *International journal of entrepreneurial behavior & research*, 16(4), 329-348.
- Etzkowitz. (1998). The norms of entrepreneurial science: cognitive effects of the new university and industry linkages. *Research Policy*, 27(8), 823-833.
- Etzkowitz, H. (2003). Research groups as a quasi-firms: the invention of the entrepreneurial university. *Research Policy*, 32(1), 109-121.
- Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: from National Systems and “Mode 2” to a Triple Helix of university–industry–government relations. *Research Policy*, 29(2), 109-123.
- Fayolle, A., Gailly, B., & Lassas-Clerc, N. (2006). Assessing the impact of entrepreneurship education programmes: a new methodology. *Journal of European industrial training*, 30(9), 701-720.
- Fernández-Pérez, V., Alonso-Galicia, P. E., Rodríguez-Ariza, L., & del Mar Fuentes-Fuentes, M. (2015). Professional and personal social networks: A bridge to entrepreneurship for academics? *European Management Journal*, 33(1), 37-47.
- Fini, R., Grimaldi, R., Santoni, S., & Sobrero, M. (2011). Complements or substitutes? The role of universities and local context in supporting the creation of academic spin-offs. *Research Policy*, 40(8), 1113-1127.
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Amsterdam: Addison-Wisley Publishing Company.
- Florida, R., & Cohen, W. (1999). Engine or infrastructure? The university role in economic development. L. Branscomb, F. Kodama, & R. Florida (Ed.) *Industrializing Knowledge*.(589-610): Cambridge, MA: MIT Press.
- Freitas, I. M. B., Marques, R. A., & e Silva, E. M. d. P. (2013). University–industry collaboration and innovation in emergent and mature industries in new industrialized countries. *Research Policy*, 42(2), 443-453.
- Friedman, J., & Silberman, J. (2003). University technology transfer: do incentives, management, and location matter? *The Journal of Technology Transfer*, 28(1), 17-30.



- Fritsch, M., & Schwirten, C. (1999). Enterprise-university co-operation and the role of public research institutions in regional innovation systems. *Industry and innovation*, 6(1), 69-83.
- Fujisue, K. (1998). Promotion of academia-industry cooperation in Japan—establishing the “law of promoting technology transfer from university to industry” in Japan. *Technovation*, 18(6), 371-381.
- Garduño, E. (2004). South African university technology transfer: A comparative analysis. *International Intellectual Property Institute Report*.
- Gartner, W. B. (1988). Who is an entrepreneur? is the wrong question. *American journal of small business*, 12(4), 11-32.
- Gartner, W. B., Bird, B. J., & Starr, J. A. (1992). Acting as if: Differentiating entrepreneurial from organizational behavior. *Entrepreneurship theory and practice*, 16(3), 13-31.
- Grandi, A., & Grimaldi, R. (2005). Academics' organizational characteristics and the generation of successful business ideas. *Journal of Business Venturing*, 20(6), 821-845.
- Granhagen, M., & Volkmann, C. K. (2014). Antecedents of academics entrepreneurial intentions developing a people-oriented model for university entrepreneurship. *International Journal of Entrepreneurial Venturing*, 6(2), 179-200.
- Grimaldi, R., Kenney, M., Siegel, D. S., & Wright, M. (2011). 30 years after Bayh–Dole: Reassessing academic entrepreneurship. *Research Policy*, 40(8), 1045-1057.
- Grimaldi, R., Kenney, M., Siegel, D. S., & Wright, M. (2011). 30 years after Bayh–Dole: Reassessing academic entrepreneurship. *Research Policy*, 40(8), 1045-1057.
- Gulbrandsen, M., & Smeby, J.-C. (2005). Industry funding and university professors' research performance. *Research Policy*, 34(6), 932-950.
- Hair, J. F., Anderson, R. E., Babin, B. J., & Black, W. C. (2010). *Multivariate data analysis: A global perspective* (Vol. 7). New Jersey: Pearson Upper Saddle River.

- Hane, G. (1999). Comparing university–industry linkages in the United States and Japan. *Industrializing Knowledge: University-Industry Linkages in Japan and the United States*. MIT Press, Cambridge, MA, 20-61.
- Hannibal, M., Evers, N., & Servais, P. (2016). Opportunity recognition and international new venture creation in university spin-offs—Cases from Denmark and Ireland. *Journal of International Entrepreneurship*, 14(3), 345-372.
- Hmieleski, K. M., & Baron, R. A. (2008). When does entrepreneurial self-efficacy enhance versus reduce firm performance? *Strategic Entrepreneurship Journal*, 2(1), 57-72.
- Hoang, H., & Antoncic, B. (2003). Network-based research in entrepreneurship: A critical review. *Journal of Business Venturing*, 18(2), 165-187.
- Jenkins. (1997). Entrepreneurial intentions and outcomes: A comparative causal mapping study. *Journal of Management Studies*, 34(6), 895-920.
- Kalar, B., & Antoncic, B. (2015). The entrepreneurial university, academic activities and technology and knowledge transfer in four European countries. *Technovation*, 36, 1-11.
- Karlsson, M. (2004). *Commercialization of Research Results in the United States -An Overview of Federal and Academic Technology Transfer*. Retrieved from Sweden: <https://www.tillvaxtanalys.se/download/18.6a3ab2f1525cf0f4f95eb7f/1453901721260/Commercialization+of+research+results+in+the+United+States-04.pdf>
- Katz, J., & Gartner, W. B. (1988). Properties of emerging organizations. *Academy of management Review*, 13(3), 429-441.
- Kazanjian, R. K. (1988). Relation of dominant problems to stages of growth in technology-based new ventures. *Academy of management journal*, 31(2), 257-279.
- Khamisa, N., Peltzer, K., Ilic, D., & Oldenburg, B. (2014). Evaluating research recruitment strategies to improve response rates amongst South African nurses. *SA Journal of Industrial Psychology*, 40(1), 01-07.
- Kilonzo, P. M., & Nyambegera, S. M. (2014). Determinants of entrepreneurial intention among university business students in Kenya: lessons from Kenyatta University. *International Journal of Entrepreneurship and Small Business*, 22(2), 231-250.

- Kogut, B. (2000). The network as knowledge: Generative rules and the emergence of structure. *Strategic management journal*, 405-425.
- Kothari, C. R. (2004). *Research methodology: methods and techniques*. New Delhi: New Age International.
- Kristiansen, S., & Indarti, N. (2004). Entrepreneurial intention among Indonesian and Norwegian students. *Journal of Enterprising Culture*, 12(01), 55-78.
- Krueger Jr, N. F., Reilly, M. D., & Carsrud, A. L. (2000). Competing models of entrepreneurial intentions. *Journal of Business Venturing*, 15(5), 411-432.
- Krueger, N. F., & Carsrud, A. L. (1993). Entrepreneurial intentions: applying the theory of planned behaviour. *Entrepreneurship & Regional Development*, 5(4), 315-330.
- Kumar, S., & Phrommathed, P. (2005). *Research methodology*. New Hampshire: Springer.
- Landry, R., Amara, N., & Rherrad, I. (2006). Why are some university researchers more likely to create spin-offs than others? Evidence from Canadian universities. *Research Policy*, 35(10), 1599-1615.
- Lee, L., Wong, P. K., Der Foo, M., & Leung, A. (2011). Entrepreneurial intentions: The influence of organizational and individual factors. *Journal of Business Venturing*, 26(1), 124-136.
- Leydesdorff, L., & Etzkowitz, H. (1998). The triple helix as a model for innovation studies. *Science and Public Policy*, 25(3), 195-203.
- Liñán, F., & Santos, F. J. (2007). Does social capital affect entrepreneurial intentions? *International Advances in Economic Research*, 13(4), 443-453.
- Lockett, A., Wright, M., & Franklin, S. (2003). Technology transfer and universities' spin-out strategies. *Small Business Economics*, 20(2), 185-200.
- López-Martínez, R., Medellín, E., Scanlon, A., & Solleiro, J. (1994). Motivations and obstacles to university industry cooperation (UIC): a Mexican case. *R&D Management*, 24(1), 017-030.
- Malonet, D. E., & Roberts, E. (1996). Policies and structures for spinning off new companies from research and development organizations. *R&D Management*, 26(1), 17-48.

- Mansour, S., & Maliqi, M. (2016). *University Spinoffs and the New Venture Creation Process. A Case Study of Lund University Spinoff Model*. (Master's thesis), Lund University, Unpublished. Retrieved from <http://lup.lub.lu.se/luur/download?func=downloadFile&recordOid=8878797&fileOid=8880472>
- McClelland, D. C. (1961). *Achieving society*. Princeton, New Jersey: D. Van Nostrand.
- McMullen, J. S., & Shepherd, D. A. (2002). Regulatory focus and entrepreneurial intention: Action bias in the recognition and evaluation of opportunities. *Frontiers of Entrepreneurship Research*, 61-72.
- Montoro-Sanchez, A., Mora-Valentin, E. M., & Guerras-Martin, L. A. (2006). R&D cooperative agreements between firms and research organisations: a comparative analysis of the characteristics and reasons depending on the nature of the partner. *international Journal of technology management*, 35(1-4), 156-181.
- Motohashi, K. (2005). University–industry collaborations in Japan: The role of new technology-based firms in transforming the National Innovation System. *Research Policy*, 34(5), 583-594.
- Motohashi, K., & Muramatsu, S. (2012). Examining the university industry collaboration policy in Japan: Patent analysis. *Technology in Society*, 34(2), 149-162.
- Mueller, P. (2006). Exploring the knowledge filter: How entrepreneurship and university industry relationships drive economic growth. *Research Policy*, 35(10), 1499-1508.
- Mugenda, O., & Mugenda, A. (2008). *Research methodology*. Nairobi: African Centre for Technology Studies.
- Murray, F. (2004). The role of academic inventors in entrepreneurial firms: sharing the laboratory life. *Research Policy*, 33(4), 643-659.
- NACOSTI. (2013). *Strategic plan 2014-2018*. Nairobi: National Commission for Science, Technology and Innovation Retrieved from <https://www.nacosti.go.ke/>.
- Naktiyok, A., Karabey, C. N., & Gulluce, A. C. (2009). Entrepreneurial self-efficacy and entrepreneurial intention: the Turkish case. *International Entrepreneurship and Management Journal*, 6(4), 419-435.

- Naktiyok, A., Karabey, C. N., & Gulluce, A. C. (2010). Entrepreneurial self-efficacy and entrepreneurial intention: the Turkish case. *International Entrepreneurship and Management Journal*, 6(4), 419-435.
- Ndonzuau, F. d. r. N., Pirnay, F., & Surlemont, B. (2002). A stage model of academic spin-off creation. *Technovation*, 22(5), 281-289.
- Ndonzuau, F. N., Pirnay, F., & Surlemont, B. (2002). A stage model of academic spin-off creation. *Technovation*, 22(5), 281-289.
- Nicolaou, N., & Birley, S. (2003). Academic networks in a trichotomous categorisation of university spinouts. *Journal of Business Venturing*, 18(3), 333-359.
- Nlemvo, N., Fabrice, P., & Bernard, S. (2002). A stage model of academic spin-off creation. *Technovation*, 22(5), 281-289.
- Oduwaiye, R., Owolabi, H., & Onasanya, S. (2009). *Research dissemination, utilization and commercialization by academic staff of a Nigerian university*. Paper presented at the HERPNET-KIU International Conference on Research in African Higher Education for Sustainable Development.
- OECD. (2013). *Commercialising Public Research: New Trends and Strategies*. Retrieved from Paris, France: <http://www.oecd.org/science/sci-tech/commercialising-public-research.pdf>
- Ogada, T. (2015). Linking Universities and R&D Institutions to the Public and Private Sector for Management and Promotion and Commercialization of IP Assets. Retrieved from [http://www.wipo.int/edocs/mdocs/africa/en/wipo\\_hl\\_ip\\_kla\\_15/wipo\\_hl\\_ip\\_kla\\_15\\_t\\_9.pdf](http://www.wipo.int/edocs/mdocs/africa/en/wipo_hl_ip_kla_15/wipo_hl_ip_kla_15_t_9.pdf)
- Ogunwusi, A., & Ibrahim, H. (2014). Promoting Industrialization through Commercialization of Innovation in Nigeria. 4 (7). Retrieved online from [www.iiste.org/journals/index.php/IEL/article/view/14178](http://www.iiste.org/journals/index.php/IEL/article/view/14178).
- Oliver, A. L. (2004). Biotechnology entrepreneurial scientists and their collaborations. *Research Policy*, 33(4), 583-597.

- Ozgen, E., & Baron, R. A. (2007). Social sources of information in opportunity recognition: Effects of mentors, industry networks, and professional forums. *Journal of Business Venturing*, 22(2), 174-192.
- Pattnaik, P. N., & Pandey, S. C. (2014). University Spinoffs: What, Why, and How? *Technology Innovation Management Review*, 4(12).
- Perkmann, M., Tartari, V., McKelvey, M., Autio, E., Broström, A., D'Este, P., . . . Hughes, A. (2013). Academic engagement and commercialisation: A review of the literature on university–industry relations. *Research Policy*, 42(2), 423-442.
- Pihie, Z. A. L., & Bagheri, A. (2013). Self-Efficacy and Entrepreneurial Intention: The mediation effect of self-regulation. *Vocations and Learning*, 6(3), 385-401.
- Prodan, I., & Drnovsek, M. (2010). Conceptualizing academic-entrepreneurial intentions: An empirical test. *Technovation*, 30(5), 332-347.
- Radhakrishna, R. B. (2007). Tips for developing and testing questionnaires/instruments. *Journal of extension*, 8(2), 201-221.
- Rawat, S., & Meena, S. (2014). Publish or perish: Where are we heading? *Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences*, 19(2), 87.
- ROK. (2007). *Vision 2030*. Nairobi: Government Printer Retrieved from <http://www.vision2030.go.ke/vision-2030-publications/>.
- ROK. (2008). *Science, Technology and Innovation Policy and Strategy*. Nairobi: Government Printer.
- Rothaermel, F. T., Agung, S. D., & Jiang, L. (2007). University entrepreneurship: a taxonomy of the literature. *Industrial and corporate change*, 16(4), 691-791.
- Sætre, A. S., Wiggins, J., Atkinson, O. T., & Atkinson, B. K. E. (2009). University spin-offs as technology transfer: a comparative study among Norway, the United States, and Sweden. *Comparative Technology Transfer and Society*, 7(2), 115-145.
- Sakakibara, M. (2007). *Assessing the role of university patent rights: US-Japan comparison of university-industry knowledge transfer*. Paper presented at the DRUID Summer Conference 2007 on Appropriability, Proximity, Routines and Innovation.

- Saunders, M. N. (2011). *Research methods for business students* (5th ed.). Edinburg: Pearson Education Limited.
- Scherer, R. F., Adams, J. S., & Wiebe, F. A. (1989). Developing entrepreneurial behaviours: A social learning theory perspective. *Journal of Organizational Change Management*, 2(3), 16-27.
- Schumpeter, J. A. (1934). *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle* (Vol. 55). New Brunswick, USA: Transaction publishers.
- Science, Technology and Innovation Act, Law of Kenya, NO. 28 of 2013 Stat. (2013).
- Senelwa, W., Elegwa, M., & Kihoro, J. (2016). Entrepreneurial Self Efficacy Influence on the Creation of University Spin-off firms in Kenya. *IOSR Journal of Business and Management*, 18(10), 49-58.
- Senker, J., & Senker, P. (1997). Implications of industrial relationships for universities: a case study of the UK Teaching Company Scheme. *Science and Public Policy*, 24(3), 173-182.
- Setiawan, J. L. (2014). Examining entrepreneurial self-efficacy among students. *Procedia-social and behavioral sciences*, 115, 235-242.
- Shane, S. (2000). Prior knowledge and the discovery of entrepreneurial opportunities. *Organization Science*, 11(4), 448-469.
- Shane, S. (2004). *Academic entrepreneurship: University spinoffs and wealth creation*. New York: Edward Elgar Publishing.
- Shane, S., & Eckhardt, J. (2003). The individual-opportunity nexus *Handbook of entrepreneurship research*. New York: Springer.
- Shane, S., & Stuart, T. (2002). Organizational endowments and the performance of university start-ups. *Management science*, 48(1), 154-170.
- Shimoda, R. (2005). Intellectual Property Management of National University Corporations. *International Journal of Intellectual Property-Law, Economy and Management*, 1(1), 37-45.

- Shinnar, R. S., Giacomini, O., & Janssen, F. (2012). Entrepreneurial perceptions and intentions: The role of gender and culture. *Entrepreneurship theory and practice*, 36(3), 465-493.
- Siegel, D., Waldman, D., & Link, A. (2003). Assessing the impact of organizational practices on the productivity of university technology transfer offices: An exploratory study. 32(1), 27-48.
- Siegel, D. S., Waldman, D. A., Atwater, L. E., & Link, A. N. (2003). Commercial knowledge transfers from universities to firms: improving the effectiveness of university–industry collaboration. *The Journal of High Technology Management Research*, 14(1), 111-133.
- Simon, M. (2011). Analysis of Qualitative Data. *Dissertation and Scholarly Research: Recipes for Success*. Seattle: LLC.
- Simpeh, K. N. (2011). Entrepreneurship theories and Empirical research: A Summary Review of the Literature. *European Journal of Business and Management*, 3(6), 1-8.
- Siu, W. s., & Lo, E. S. c. (2013). Cultural contingency in the cognitive model of entrepreneurial intention. *Entrepreneurship theory and practice*, 37(2), 147-173.
- Smilor, R. W., Gibson, D. V., & Dietrich, G. B. (1990). University spin-out companies: technology start-ups from UT-Austin. *Journal of Business Venturing*, 5(1), 63-76.
- Solow, R. M. (1994). Perspectives on growth theory. *The Journal of Economic Perspectives*, 8(1), 45-54.
- Souitaris, V., Zerbinati, S., & Al-Laham, A. (2007). Do entrepreneurship programmes raise entrepreneurial intention of science and engineering students? The effect of learning, inspiration and resources. *Journal of Business Venturing*, 22(4), 566-591.
- Swamidass, P. M. (2013). University startups as a commercialization alternative: lessons from three contrasting case studies. *The Journal of Technology Transfer*, 38(6), 788-808.
- Tantiyaswasdikul, K. (2012). The impact of the breadth of patent protection and the Japanese university patents. *International Journal of Innovation, Management and Technology*, 3(6), 754.



- Timmons, J. A., & Spinelli, S. (1999). *New venture creation: Entrepreneurship for the 21st century*. Columbus: OH: McGraw-Hill Higher Education.
- Tubbs, M. E., & Ekeberg, S. E. (1991). The role of intentions in work motivation: Implications for goal-setting theory and research. *Academy of management Review*, *16*(1), 180-199.
- UNECA. (2013). *National Experiences in the Transfer of Publicly Funded Technologies in Africa: Ghana, Kenya and Zambia* Retrieved from Addis Ababa: <http://www.uneca.org/sites/default/files/PublicationFiles/transfer-of-publicly-funded-tech-in-africa.pdf>
- Uzzi, B., & Spiro, J. (2005). Collaboration and creativity: The small world problem 1. *American journal of sociology*, *111*(2), 447-504.
- Venkataraman, S. (1997). The distinctive domain of entrepreneurship research. *Advances in entrepreneurship, firm emergence and growth*, *3*(1), 119-138.
- Vohora, A., Wright, M., & Lockett, A. (2004). Critical junctures in the development of university high-tech spinout companies. *Research Policy*, *33*(1), 147-175.
- Wallmark, J. T. (1997). Inventions and patents at universities: the case of Chalmers University of Technology. *Technovation*, *17*(3), 127-139.
- Walsh, J. P., Baba, Y., Goto, A., & Yasaki, Y. (2008). Promoting University–Industry Linkages in Japan: Faculty Responses to a Changing Policy Environment 1. *Prometheus*, *26*(1), 39-54.
- Walter, A., Auer, M., & Ritter, T. (2006). The impact of network capabilities and entrepreneurial orientation on university spin-off performance. *Journal of Business Venturing*, *21*(4), 541-567.
- Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic management journal*, *5*(2), 171-180.
- William, G. (1985). A conceptual framework for describing the phenomenon of new venture creation. *Academy of management Review*, *10*(4), 696-706.
- Wilson, F., Kickul, J., & Marlino, D. (2007). Gender, entrepreneurial self-efficacy, and entrepreneurial career intentions: implications for entrepreneurship education. *Entrepreneurship theory and practice*, *31*(3), 387-406.

- Witt, P. (2004). Entrepreneurs' networks and the success of start-ups. *Entrepreneurship & Regional Development, 16*(5), 391-412.
- Wu, Y., Welch, E. W., & Huang, W.-L. Commercialization of university inventions: Individual and institutional factors affecting licensing of university patents. *Technovation, 36*, 12-25.
- Yıldırım, N., & Aşkun, O. B. (2012). Entrepreneurship intentions of public universities in turkey: going beyond education and research? *Procedia-social and behavioral sciences, 58*, 953-963.
- Yusuf, S., & Nabeshima, K. (2007). *How universities promote economic growth*. New York: World Bank Publications.
- Zhao, H., Seibert, S. E., & Hills, G. E. (2005). The mediating role of self-efficacy in the development of entrepreneurial intentions. *Journal of applied psychology, 90*(6), 1265.
- Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2013). *Business research methods*. New York: Cengage Learning.

## APPENDICES

### Appendix I: Questionnaire

**NB:**

**Academic Entrepreneurial Intention:** *It is the conscious state of mind directing individual attention, experience, and behavior toward planned entrepreneurial behavior.*

**University spin-offs:** *Refers to a new company founded to exploit a piece of intellectual property created in the university.*

#### PART 1: PERSONAL DATA

**Gender:** (Kindly tick as appropriate)

Male [ ]                      Female [ ]

**Age:** (Kindly tick as appropriate)

21-30 years [ ] 31-40 years [ ] 41-50 years [ ] 51 – 60 years [ ] 61 – 70 years [ ]

**Academic Qualification:** (Tick the highest level reached)

Bachelors [ ]    Masters [ ]    PhD [ ]    Any other: - Specify

.....

**Area of specialization:** (Kindly tick as appropriate)

Pure and Applied Sciences [ ]    Medicine [ ]    Pharmacy [ ]    Engineering [ ]  
Architecture [ ]

Information Technology/Computer Science [ ] Agriculture [ ] Biotechnology [ ]  
Mathematics [ ]

Any other: -

Specify.....

...

#### PART 2: GENERAL VARIABLE

##### Academic entrepreneurial intentions

- 1) Please indicate the extent of your agreement with the listed statements about your academic entrepreneurial intentions in creating University spin-off firms. Kindly tick appropriately where; SD=Strongly Disagree, D=Disagree, N=neither Disagree nor Agree, A=Agree, SA=Strongly Agree.

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ITEM	SD	D	N	A	SA
a) My professional goal is to become an entrepreneur.					

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- 
- b) I have put in place every effort to start and run my own firm.
  - c) I don't have the well-grounded intention to start a business someday.
  - d) Being an entrepreneur would entail great satisfactions for me.
  - e) I have refined or improved the business idea.
  - f) I can control the creation process of a new firm.
  - g) If I tried to start a firm, I would have a low probability of succeeding.
  - h) In case, I identified possibilities for a commercial application my inventions, I would consider becoming an entrepreneur to commercialize the opportunity.
  - i) I have not developed my business goals and objectives, organization structure, strategic plan.
  - j) I have searched for financing.
  - k) I have not gathered information on customers, competitors in the industry.

---

2) In the event, you have the opportunity and resources, would you invest in a start-up business?

Yes [ ]                      No [ ]

Explain your answer

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 .....  
 .....  
 .....

**PART 3: SPECIFIC VARIABLES**

**3. A: Creation of University Spin-Off Firms/Technology Transfer Process**

1) Please indicate the extent of your agreement with the listed statements about your academic entrepreneurial intentions in creating University spin-off firms. Kindly tick appropriately where; SD=Strongly Disagree, D=Disagree, N=neither Disagree nor Agree, A=Agree, SA=Strongly Agree.

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ITEM	SD	D	N	A	SA
a) The "Publish or Perish" drive among academia is enhancing idea generation in the university.					
b) Idea assessment for economic potential is intensively done at the university.					

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- c) The university always identifies the owners of research results which the idea is based on.
  - d) Protection of the results from counterfeiting, copying, and imitations is not done.
  - e) There is production of a prototype that verifies the possibilities of industrial exploitation.
  - f) No business plan development is done to enhance the exploitation of the opportunity.
  - g) There is easy access to material and financial resources for prototyping and starting a business.
  - h) Personal relationships between university and the researcher are amiable.
  - i) The university encourages relocation of business risk to high-growth markets and international arena.
  - j) The management ensures full exploitation of industrial potential of the technological projects.
  
  - k) Researches and technologies are not completely based on customer needs.
  - l) There is lack of solid rules and regulations for protecting Intellectual Property (IP) rights.
  - m) There is lack of seed-financing and human resources.
  
  - n) University managers are unclear about priorities and goals regarding technology transfer.
  - o) Informational and cultural barriers exist between university and industry hence lack of trust and respect.
  - p) Institutionalize the documentation and evaluation systems at the university in order to better protect Intellectual Property rights.
  - q) Develop an appropriate regulatory structure and revise the existing rules and regulations.
  - r) Finance researches and innovations with both governmental and non- governmental budgets and funds.
  - s) Government should offer tax exemptions in order to motivate investors.
  - t) University should develop sales and marketing unit to assist in commercialization.
- 

- 2) In what phase of the creation of a university spin off firm is your business?
- (i) Generate phase [ ]
  - (ii) Finalize phase [ ]
  - (iii) Launch phase [ ]
  - (iv) Strengthen phase [ ]

Explain your answer

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.....

**3. B: Entrepreneurial Self- Efficiency**

- 1) Please indicate the extent of your agreement with the listed statements about your academic entrepreneurial intentions in creating University spin-off firms. Kindly tick appropriately where;  
SD=Strongly Disagree, D=Disagree, N=neither Disagree nor Agree, A=Agree, SA=Strongly Agree.

ITEM	SD	D	N	A	SA
a) I can discover new ways to improve existing products					
b) I can see new market opportunities for new products and services.					
c) I cannot identify new areas for potential growth.					
d) I struggle to bring product concepts to market in a timely manner.					
e) I do not tolerate unexpected changes in business conditions.					
f) I can work productively under continuous stress, pressure and conflict.					
g) I can maintain a positive look despite setbacks and negative feedback from naysayers.					
h) I struggle to identify and build management teams.					
i) I can recruit and train key employees.					
j) I can focus on the demands of the business despite the inevitable conflict between one's personal and professional life.					
k) I hardly tap into the expertise of others.					
l) I do not convince other to join with me in pursuit of my vision.					
m) I can inspire others to embrace vision and values of the company.					
n) I can manage the negotiation process to obtain outcomes favorable to me.					
o) I have difficulties in formulating set of actions in pursuit of my business opportunities.					

- 
- p) I can create a working environment that encourages people to try out something new
  - q) I can encourage people to take initiatives and responsibilities for their ideas and decisions, regardless of outcome.
  - r) I struggle to develop and maintain favorable relationships with potential investors.
- 

2) In what ways can you improve your own capabilities in recognizing entrepreneurial opportunities and new product development from university research?

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 .....  
 .....  
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**3. C: Personal and Professional Networks**

1) Please indicate the extent of your agreement with the listed statements about your academic entrepreneurial intentions in creating University spin-off firms. Kindly tick appropriately where; SD=Strongly Disagree, D=Disagree, N=neither Disagree nor Agree, A=Agree, SA=Strongly Agree.

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ITEM	SD	D	N	A	SA
a) I have insufficient time within the normal working/learning for consultancy assignments period.					
b) I regularly attend scientific and technological workshops and conferences.					
c) There is minimal involvement of technology transfer office in developing and enhancing academic-industry relations.					
d) The industry does not provide entrepreneurs with information on market and new opportunities.					
e) Rules and regulations for academic-industry interactions are fully enforced.					
f) The industry denies researchers the opportunity to test and eventually license their new discovery.					
g) The industry provides entrepreneurs with tangible resources (e.g., human resources, financial resources).					
h) The industry gives entrepreneurs in-tangible resources (e.g., social support, problem solving).					
i) University should make use of alumni to expand network with industry.					
j) University should create offices of economic development & entrepreneurship.					

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k) University should create boards where deans are represented along with commercial actors and technology-transfer officers.

---

2) Does your university encourage you to have direct contacts with industry players on networking and interaction opportunities?

Yes [ ]                      No [ ]

Explain your answer

.....  
.....  
.....  
.....

**3. D: Co-operation With Industry**

1) Please indicate the extent of your agreement with the listed statements on university's co-operation with industry. Kindly tick appropriately where; SD=Strongly Disagree, D=Disagree, N=neither Disagree nor Agree, A=Agree, SA=Strongly Agree.

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ITEM	SD	D	N	A	SA
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<b>1. Financial</b>					
a) To gain financial support.					
b) To access additional and alternative financial resources sources including national and county governments grants.					
<b>2. Technological</b>					
a) To access firm's resources, knowledge, technologies and their best practices.					
b) To increase number of innovations on products and processes.					
<b>3. Strategic</b>					
a) To maintain and improve University's competitive advantage.					
b) To reduce risk.					
c) To access to new markets.					
d) To access strategic resources of the firms.					
e) To improve the University's image/prestige/reputation.					
<b>4. Educational</b>					
a) To conduct recruitment and train employees.					

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- b) To facilitate mobility of the firm's staff.
- c) To assist in the citations and publications in specialized journals, doctoral dissertations, research projects and the presentation of research results at conferences and workshops.

**5. Political**

- a) To help in the adaptation to governmental initiatives.

Please indicate the extent of your agreement with the listed statements about your academic entrepreneurial intentions in creating University spin-off firms. Kindly tick appropriately where; SD=Strongly Disagree, D=Disagree, N=neither Disagree nor Agree, A=Agree, SA=Strongly Agree.

ITEM	SD	D	N	A	SA
a) The University mission, vision and core strategy emphasizes collaboration with industry.					
b) University has built collaborations with industry, academic institutions and other related parties like NGOs.					
c) Negotiations for university-industry collaborations and partnerships are transparent and efficient.					
d) Industry-university collaboration centers have influenced the flow of trade by patenting and marketing university research.					
e) There are insufficient financial resources for research commercialization.					
f) There is a deficiency of skills in innovation and intellectual property management.					
g) There are rigid University's rules and regulations on external collaborations.					
h) There are weaknesses in networking and co-operation with external parties.					
i) There is inadequate information on suitable collaborative partners.					
j) There exist inappropriate business models for partnership.					

- 2) What are some of the key operational mechanisms that should be put in place in order to overcome the barriers that hinder effective technology transfer in University-Industry partnerships?
- .....
- .....
- .....
- .....

**3. E: Opportunity Identification and Recognition**

1) Please indicate the extent of your agreement with the listed statements about your academic entrepreneurial intentions in creating University spin-off firms. Kindly tick appropriately where; SD=Strongly Disagree, D=Disagree, N=neither Disagree nor Agree, A=Agree, SA=Strongly Agree.

ITEM	SD	D	N	A	SA
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- a) I am not resilient enough to overcome life’s struggles.
- b) I often feel optimistic in my entrepreneurial discoveries.
- c) I struggle to discover opportunities where others see creativity.
- d) I have the ability to achieve specific goals.
- e) While going about routine day-to-day activities, I see potential new venture ideas all around me
- f) Having prior knowledge of markets, ways to serve markets and customer problems has helped in recognizing certain opportunities.
- g) Having prior knowledge triggers recognition of the value of the new information.
- h) My contacts or discussions with potential or existing customers have not helped me to recognize opportunities.
- i) My contacts or discussions with existing suppliers, distributors, or manufacturers help me to recognize opportunities.
- j) My social and professional contacts help me to recognize opportunities

1) Do often have a special “alertness” or sensitivity toward new venture opportunities in your immediate environment?

Yes [ ]      No [ ]

Explain your answer

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### 3. F: University Contextual Elements

- 1) Please indicate the extent of your agreement with the listed statements about your academic entrepreneurial intentions in creating University spin-off firms. Kindly tick appropriately where; SD=Strongly Disagree, D=Disagree, N=neither Disagree nor Agree, A=Agree, SA=Strongly Agree.

ITEM	SD	D	N	A	SA
a) The university has good facilities for supporting new entrepreneurial innovations and venture.					
b) The university does not provide sufficient incentives and rewards for academics.					
c) There is weak entrepreneurial culture within the university.					
d) There are inaccurate technology transfer policies and procedures in the university which are hardly communicated.					
e) The technology transfer policy targets creation of growth oriented ventures with emphasis to access to numerous opportunities and resources.					
f) No organizational re-structuring has been conducted within the universities to promote entrepreneurship and technology transfer.					
g) Barriers that prevent entrepreneurship development within the organization are not well defined and mitigation measures not outlined.					
h) University has either launched or enhanced the existing “multi-disciplinary Entrepreneurship Centre” that has effectively revealed the entrepreneurial intentions and competency of the university.					
i) The Technology transfer offices do very little to promote linkages between academia and industry other universities.					
j) The existence of incubators in the university has added value to the image of the university and created student employees.					
k) Establishment of Science parks and techno poles within the university has not enhanced the entrepreneurial culture.					
l) Technology transfer offices provides a better engagement of academics in knowledge transfer activities, recognizes commercial opportunities of research activities.					
2) Does your University mission, vision and core strategy encourage entrepreneurship and technology/knowledge transfer among staff and students? Yes [ ]      No [ ]					

Explain your answer

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.....

**THANK YOU FOR YOUR PARTICIPATION IN THE STUDY**

## Appendix II: Reliability coefficients of the study variables

Variable	Number of Items	Reliability Cronbach's Alpha	Comments
Entrepreneurial Self Efficacy	18	0.842	Good
Personal and Professional Networks	10	0.734	Accepted
Co-operation with Industry	23	0.852	Good
University Contextual Elements (UCE)	12	0.833	Good
Opportunity Identification and Recognition	10	0.789	Accepted
Creation of Spin-off firms	20	0.796	Accepted
Academic entrepreneurial intentions	11	0.851	Good

## Appendix III: Adjustment of sample size

$$\text{No of respondents} = \frac{n}{\text{response Rate}}$$

$$= \frac{323}{0.81}$$

$$\approx 400$$

## **Appendix IV: Introduction letter**