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ARTICLE INFO	Amelia Rorwana and Robertson K. Tengeh (2015). The role of academic entrepreneurs in the process of technology transfer and commercialization: the case of a University of Technology in South Africa,. *Environmental Economics*, *6*(4), 25-37
RELEASED ON	Tuesday, 08 December 2015
JOURNAL	"Environmental Economics"
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES **0**

NUMBER OF FIGURES **0**

NUMBER OF TABLES **0**

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The role of academic entrepreneurs in the process of technology transfer and commercialization: the case of a University of Technology in South Africa

Abstract

Universities are known to be the main contributors of knowledge, innovation and technology advancements. Interest in academic entrepreneurship and creation of university spin-off companies has grown in South Africa. This study aims to establish the factors that inspire academics to engage in entrepreneurial activities and to identify the role that academic entrepreneurs play in the process of technology transfer and commercialization at University of Technology (UoT) X. A quantitative research approach is adopted throughout this study. As part of the quantitative research approach, structured questionnaires were directly administered to the respondents to collect the data. Specifically, 52 electronic survey questionnaires were distributed. The sample is drawn from two databases compiled, using UOT X's internal research records. One of the databases, held a list of those academics who have been active in terms of research as evident in their research outputs – technology creation and transfer. The other database (control group) holds a list of those academics that have not been active. From both groups, a purposive sample is drawn for the survey questionnaire. This study notes that pull factors tend to influence the entrepreneurial activities of academics at UOT X more than push factors and that academics are key players in the process of technology transfer. Thus, this study may assist the university senior management to develop strategies to improve academic entrepreneurship for all faculties. In line with this, it is expected that the primary function of UOT X should be to instil a greater entrepreneurial spirit among the relevant stakeholders.

Keywords: academic entrepreneurship, technology transfer, technology commercialization, South Africa.
JEL Classification: L26, M13, O31, O32, O33.

Introduction

A growing number of studies continue to highlight the importance of entrepreneurship as it has been noted to be the engine of most economies (Harper, 2003). Entrepreneurship has been particularly praised for its positive contribution to growth, employment and poverty reduction. In line with the foregoing, public research organizations and particularly universities are becoming progressively entrepreneurial, aiming to realize the commercial value of their research (Rothaermel, Agung & Jian, 2007). It is believed that the engagement of Higher Education Institutions (HEIs) in entrepreneurial activities in recent years can be partly attributed to the implicit need for economic development and increased attention to social responsibility (Alessandrini, Klose & Pepper, 2013).

In view of the growing call on universities to be the fore bearers of knowledge and development, the technology transfer processes have become mandatory in a number of universities, prompting dedicated Technology Transfer Offices (TTOs) to support the initiative (Alessandrini, Klose & Pepper, 2013). Like universities, the South African government sees the urge to commercialize research output as the opportunity to drive the country into a "knowledge economy" in order to spur economic growth (Department of Science and Technology, South Africa).

It is worth noting that though South Africa has made considerable progress towards becoming a knowledge economy, a number of challenges especially with respect to R&D and innovation encumber its efforts. Among others, these challenges are entail a relatively limited number of scientists and engineers; the high costs of innovation; and limited collaborative partnerships for innovation and technology commercialization (Schwab, 2011 cited in Alessandrini, Klose & Pepper, 2013).

Customarily, Higher Education Institutions (HEIs) have stood as the engine of scientific discovery, a source of knowledge creation and technological innovation. Thus, the thriving associations between universities and industry as well as the commercialization of academic research have been the subject matter of policy and research debate since the mid-1980s (Kutinlahti, 2005). It is worthy to mention that this pattern is still trendy today, with a growing number of universities making a concerted effort to commercialize their research and to develop linkages with the industry.

South African Institutions have gone through a significant transformation post the 1994 democratic elections. The University of Technology being the focus of this paper has not been able to escape the impact of higher education transformation (Nicolaides, 2011).

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1. Research problem and background

Universities have been involved in the process of knowledge transfer and external partnerships with the communities they serve for a while (Etzkowitz, 2003; Laredo, 2007). This notwithstanding the extent to which these partnerships (for instance, between university and business) have become formalized and promoted has been limited and tend to vary between countries in general and universities in particular. This research study seeks to understand the position of UOT X as a university of technology in terms of technology creation and commercialization. More specifically, the study seeks to understand the dynamics surrounding the creation and transfer of technology in South Africa, using UOT X as a case study.

Concurring with Ssebuwufu, Ludwick and Beland (2012), Derbew, Mungamuru and Asnake (2015), assert that most Universities of Technology in Africa lack an enabling environment for recreating and aligning themselves with a more entrepreneurial role. In spite of criticisms of the inadequate state of university-industry linkages in Africa, Derbew et al. (2015) believe that the state of industry linkages in Africa has improved. Shore and Mclauchlan, (2012) agree that there has been the rise in policies and practices directed at facilitating 'knowledge transfer', creating links with industry and commercializing university research.

Thus, the shift in favour of academic entrepreneurship at universities has been to a considerable extent propelled by external forces such as changes in the political economy of higher education and state disinvestment in tertiary education given that policy makers tend to see university education as a personal, private investment rather than a public good (Robertson & Kitigawa, 2009; Vernon, 2010). Consequently, it is now mandatory for public universities to seek new income streams so as to balance their budgets, meet new 'key performance indicators' and, in some cases circumvent the threat of bankruptcy (Shore & Mclauchlan, 2012). Hence, universities continue to form partnership with external stakeholder in an attempt to commercialize their research outputs, though the practicalities and implications of commercilizing are not well documented (Viale & Etzkowitz, 2010). To date, relatively little is known about how academics influence the process of technology creation and commercialization and this is particularly true of UOT X. This paper strives to understand: a) Why academics become involved in entrepreneurial activities, and b) the role that academic entrepreneurs play in the process of technology transfer and commercialization at UOT X.

2. Literature review

2.1. Definition of entrepreneurship. This refers to the ability and inclination to organize, develop and manage a business in an attempt to make a profit while considering the associated risks. Observable examples of entrepreneurship include new business start-ups (Zimmerer & Scarborough, 2004, p. 3). Thus the concept of entrepreneurship revolves around the creation of new businesses and the growth of existing ones (Wood, 2011).

Bringing in the academic angle, Meyer (2003) sees the academic entrepreneur as someone who turns the knowledge created by an institution into innovation, forms new firms, and creates marketable products and services.

2.1.1. Academic entrepreneurship. Forging a link between entrepreneurship and academic entrepreneurship, Wood (2011) posits that the university is currently an ideal reservoir for ideas and core technologies that drive entrepreneurial endeavors.

The focus of academic entrepreneurship is the business venture that is founded by a university student, technician or academic staff and it is a well-organized university-industry technology transfer systems (Doutriaux, 1987). According to Wood (2011) academic entrepreneurship is a process with different stages, but it starts with the researcher or student at the faculty level or at the laboratory. Noting that founding a new startup can be financially risky, Doutriaux (1987) suggests that the academic entrepreneur should remain on the university payroll to reduce the financial risks for himself/herself; have access to the university facilities and to increase business contacts.

While there is plenty of literature that highlight the difference between opportunity identification and opportunity exploitation (Wright et al., 2004; Park, 2005; Mitchell, 2011), considerably little is known about the factors that lead to the development of the entrepreneurial skills among academics, and this is even more the case with requisite skills.

2.2. Importance of entrepreneurship. Small and medium enterprises (SMEs) play a very important role in regional economic growth and fighting unemployment through job creation. Thus, a number of policies have been put in place to improve the state of entrepreneurship by making it easier to create SMEs (Staber & Bögenhold, 1993; Ács & Audretsch, 2003).

Substantial attempts have been made in the past years to associate knowledge and growth, on the one hand, and entrepreneurship on the other. One such attempt came from Braunerhjelm (2010) who ob-

served that a society's capacity to increase its well-being over time hinges on its potential to develop, exploit and disseminate knowledge, thereby influencing growth. Today, many would agree that new and emerging firms play a vital role in the innovations that lead to technological change and productivity growth in any society.

Countless attempts have been made to measure the impact of entrepreneurial ventures on the economy. One such initiative is the Global Entrepreneurship Monitor (GEM) that monitors entrepreneurial activities across over a number of countries worldwide. The most recent GEM report (Herrington et al., 2015) on South Africa noted a significant decline at all levels of early-stage entrepreneurship activity compared with 2013. In fact the Total Early-Stage Entrepreneurial Activity (TEA) index decreased by 34% between 2013 and 2014, thus widening the gap between South Africa and countries in sub-Saharan Africa (SSA). It looks like entrepreneurship in South Africa is regressing when compared with its counterparts in the rest of Africa.

Given that the youth (18-24 year olds) represents a significant proportion of the total population of South Africa, the responding low propensity to engage in entrepreneurial activity recorded for this group becomes a "low blow" for the economy (Herrington et al., 2015). Amongst others, Co and Mitchell (2006) believe that the low level of entrepreneurial activity in South Africa can be partly apportioned to poorly aligned educational structures. Indeed, both formal and informal education structures do not adequately prepare the youth to be skilled entrepreneurs, but condone a culture in which young South Africans dream of becoming employees rather than employers (Co & Mitchell, 2006).

As a result of the aforementioned, there is growing pressure on Higher Education Institutions (HEIs) to champion and contributed significantly to the international competitiveness of economies, particularly through the commercialization of research. In fact there are persistent demands for the sector to contribute more substantially to local economic and social development. Thus, universities are urged to take centre stage in regional development strategies (Gibb & Hannon, 2005).

2.3. Technology transfer. Lin (2003) suggests that technology comprises the theoretical and practical skills, knowledge, and objects that facilitate the development of products and services. Technology is embodied in materials, people, cognitive and physical processes, machines, facilities, and tools.

Technology transfer entails that technology changes "hands". According to Lockett et al. (2003), the most important strategy when developing spin-off companies concern the role of the entrepreneur. The academic as the technology inventor automatically takes on the role of an entrepreneur. The academic may run the spin-off company in parallel with his or her academic duties because the involvement of the inventor may add positive value and knowledge to the technology.

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). Furthermore, Wright et al. (2004) also argue that the university internal entrepreneurial culture, processes, resources and scientific disciplines should encourage the creation and development of spin-off ventures. Academics need to be trained and mentored in how to recognize opportunities, and their research ideas need to be shaped to meet the market.

2.4. The role players in technology creation and transfer in the university context. New ventures emanating from research and new knowledge tend to have high growth aspirations, even though seldom achieved. This is perhaps because growth involves risk and sometimes giving out equity to obtain the necessary financial resources. The high level of implicit knowledge that provides impetus to business ideas generated from research often requires that such unique insights are initially conceived in the minds of people (Hindle & Yencken, 2004). In this respect, university academics are noted to excel in the generation of ideas that can be exploited through business startup (Gabrielsson et al., 2012). It is worth noting that the knowledge developed by a university is instantly transmitted into a viable business. Indeed, faculty members are the principal bearers of this knowledge, especially in the very early phases of research commercialization, owing to their direct participation in its creation.

2.4.1. Government. The core role of government has been to put specific measures in place to promote industrial innovation, entrepreneurship and legislation around intellectual property (Rasmussen, Moen & Gulbrandsen, 2006).

According to Wilson (2007), many attempts have been made to encourage technology transfer activities as early as the 1980s. More care has been paid to supporting innovation in acknowledgment of its vital functions in advancing growth, enhancing competitiveness and improving quality of livelihood. The policy document referred to as the White Paper on Science and Technology (DACST, 1996) introduced in 1996 established the concept of a National Inno-

vation System (NIS). The White Paper established the platform for many key enabling policies and strategies to inform the strategic evolution of science and technology in South Africa.

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).

2.4.2. The university. 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 & Leyesdorff, 2000; Etzkowitz, 2003). 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.

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).

The university plays a major role during technology transfer. The nature of the internal university environment processes and resource have a major influence on the creation of intellectual property (IP). Securing IP is one of the main roles of the university during the technology transfer and the roles of other parties involved are very clear as per the university's policy (Wright, Birley & Mosey, 2004).

The pace at which a university develops spin-offs is influenced by the quality of the university's technology licensing office. Furthermore, the amount of resources invested in the licensing office becomes a determinant of its success. Thus, the universities that are successful in spin-offs tend to have invested considerable resources in licensing activities (Wilson, 2007), and the reverse is true (Wright et al., 2003).

2.4.3. The entrepreneur (academic). As noted earlier an academic entrepreneur can be a university professor/researcher, student, and technician. Academic entrepreneurs identify opportunities and streamline their research ideas to meet the needs of the market (Wright, Birley & Mosey, 2004). Wood (2011) concurs with Doutriaux (1987) that academic entrepreneurship is a process with different stages but it starts with the researcher or student at the faculty level or at the laboratory.

University professors are among the numerous actors involved in the transfer of knowledge and research output from university to industry. Beyond having professional knowledge in their particular scientific disciplines and a network of contacts, Van Rijnsoever et al. (2008) argue that their academic hierarchy places them in a position to expand their influence beyond campus activities like research and teaching (Baldwin & Blackburn, 1981, p. 609).

2.4.4. The industry. Academic entrepreneurship is never a single event, it is an "umbrella name" that refers to push and pull activities that universities and industry initiate to commercialize research results, to generate income for the university (Wood, 2011).

According to the following scholars (Perkmann & Walsh, 2007), the relationship between university and industry has traditionally been about transfer of intellectual property (patenting, licensing, commercialization).

Once the university has decided to secure the intellectual property, the university technology transfer office will begin to source suitable industry partners that have appropriate skills and resources to develop the innovation into a commercial viable product. The final phase of academic entrepreneurship is commercialization, which is when the university and its industry partners have made an agreement to commercialize the innovation via a license agreement or the creation of a spin-off. Once this stage is successful the university, the industry and the regional community will benefit. This stage also promotes a close collaboration between the university and the industry scientist, as well as product development teams and provides new ideas for future research (Wood, 2011).

2.5. Higher education and technology transfer in South Africa: a post 1994 reflection. 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 as Mpako-Ntusi (2003) asserts, higher education 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.

Another policy document was the National Plan for Higher Education that was introduced in 2001 (South Africa. Ministry of Education, 2001). According to this plan, "Research, in all its forms and functions, is perhaps the most powerful vehicle … It contributes to the global accumulation of knowledge and places South Africa among those nations who have active programs of knowledge generation" (South Africa, Ministry of Education, 2001, p. 67).

The New Funding Framework 2004 (South Africa. Ministry of Education, 2004) indicates three major transformational shifts: (a) institutional excellence will be measured by the quality and quantity of outputs, (b) research subsidies will be based on research outputs, and (c) no research output equals no research publications' subsidy.

2.6. Business model for technology transfer. The importance of university research in contributing to economic growth is today widely acknowledged in Western Europe (Gabrielsson et al., 2012). This, among other things, contributed to the fact that universities today are not simply envisioned to operate as suppliers of human capital, but also as developmental agents that promote regional and internal economies (Rasmussen et al., 2006).

Human capital refers to the stock of productive skills and technical knowledge embodied in labor. Human capital is one of the most vital resources of any organization because human capital underlies any organizational capability in the sense that organizations do not make decisions or allocate resources people do (Zakaria & Yusoff, 2011). Concurring, with this idea, Marimuthu, Arokiasamy and Ismail (2009) note that human capital is an important input for organizations, especially for employees' continuous improvement in the areas of knowledge, skills, and abilities. Thus, it needs to be maintained and developed via on-going investment. In this context, the way in which an organization's business model facilitates this development, eases the integration of the various systems and of the physical and human capital (Zakaria & Yusoff, 2011). This, among other things, draws from the fact that universities nowadays are not merely expected to function as providers of human capital but also as growth engines to promote regional and internal economies (Rasmussen et al., 2006).

The term 'business model' became popular in the business world during the 1990s. Academic researchers have been slower to adopt the concept, but are now giving more attention to it (Dottore et al., 2000).

Barbaroux (2012) argues that it is important for collaborators to work together and nurture the invention and commercialization of their new technology/product. Many scholars also concur that it is critical to support the invention and commercialization of the new innovation, especially in its early stages (Hindle & Yencken, 2004).

2.7. Theoretical background to the study. Given that entrepreneurship as scholarly endeavour is still in its infancy stage, many theories abound. These theories are based on different, often conflicting assumptions borrowed from a range of disciplines (Ardchvili et al., 2003). Scholars have propounded a number of theories in the field of entrepreneurship, inter alia.

2.7.1. Push and pull theory. In order to understand the factors that influence individuals to engage in entrepreneurial activities, the push and pull theory has been adopted. According to this theory, there must be push and pull factors for academics to be involved in entrepreneurial activities. From a push perspective, Smilor et al. (1990) argue that universities are pulled to spin-offs by factors such as recognition of a market opportunity, the drive to try something new, and the desire to put theory into practice. From a push angle, there are various university environmental push factors that influence start-up companies. For instance, as universities are forced by diminishing public funds to raise tuition fees, faculties likewise are pushed by diminishing support from their universities to seek outside funding. This has pushed academics to think like entrepreneurs to form spin-offs (Slaughter & Leslie, 1997).

From an individual perspective, it is clear that individuals do not get involved in venture creation not by accident (Schjoedt & Shaver, 2007). In fact, Johnson and Darnell (1976) hold that like universities, individuals are either pushed or pulled into becoming entrepreneurs. One's push factor can be another's pull factor. According to Giacomin et al. (2007, p. 3), there are a number reasons in favor of the push and pull factors not limited to the need for achievement, nascent entrepreneurship, market opportunities.

2.7.2. Maslow's hierarchy theory or need for achievement theory. According to Maslow's hierarchy, human beings have four basic needs (physiological, safety and security, social/belonging, and self-esteem) that need to be satisfied before their experiencing a self-actualization need. This theory

classifies human needs in an ascending order. Therefore Maslow's theory suggests that humans strive to satisfy their basic needs first before developing a desire to satisfy higher level needs (Gambrel & Cianci, 2003). This theory can be applied to individuals (entrepreneurs) and universities that happen to be some of the key participants in the process of the creation and commercialization of research output.

In applying this theory, one would note that entrepreneurs establish ventures to satisfy their individual needs – these needs may differ from one entrepreneur to the other. Hence, some entrepreneurs establish businesses to satisfy their basic needs: to buy food and pay rent. Others get into business because it is good for their self-esteem and to advance to the highest level of needs in the hierarchy (Carland et al., 1995).

Unlike individuals, one may argue that universities engage in the creation spin-offs to raise third-stream income. Besides, they are also driven by the need to meet government expectations, to create jobs, and to introduce new technologies to the market. Through the academic staff (individuals), universities have become entrepreneurial, thus generating third-stream income motivation (Simpeh, 2011). For the foregoing to happen, universities must utilize appropriate motivators.

2.7.3. Opportunity-based entrepreneurship theory. The proponents of the opportunity-based entrepreneurship theory postulate that an entrepreneur's personality traits, social networks and prior knowledge are antecedents of entrepreneurial alertness to business opportunities (Ardchvili et al., 2003). Entrepreneurial awareness in turn becomes an essential condition for successful opportunity recognition, identification, development and evaluation (Ardchvili et al., 2003).

Bringing together the opportunity-based entrepreneurship theory and need for achievement theory, Kuratko (2007) notes highlights of the apparent link, given that an entrepreneur must have a need for achievement to be able to identify and take advantage of market opportunities.

2.7.4. Financial capital/liquidity theory. Starting a new venture without capital can be very challenging, according to Simpeh (2011). It is easier to have access to capital for a new venture if the entrepreneur has his/her own start-up capital. This theory supports the resource theory. Various scholars are in agreement that the possession of significant personal financial resources when starting a new venture will result in a greater chance of success (Holtz-Eakin et al., 1994).

According to Markman and Baron (2003), entrepreneurship takes many forms and finance is just one of the resources. This does not dismiss the probability of starting a new venture without capital (Hurst & Lusardi, 2004, cited by Simpeh, 2011). This theory argues that having one's own financial capital or specific resources to start a new business makes it easy to identify market opportunities (Alvarez & Busenitz, 2001).

2.7.5. Business model for technology transfer. The importance of university research in contributing to economic growth is today widely acknowledged in Western Europe (Gabrielsson et al., 2012). This, among other things, contributed to the fact that universities today are not simply envisioned to operate as suppliers of human capital, but also as developmental agents that promote regional and internal economies (Rasmussen et al., 2006).

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The term 'business model' became popular in the business world during the 1990s. Academic researchers have been slower to adopt the concept, but are now giving more attention to it (Dottore et al., 2000).

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3. Research methodology

3.1. Research technique. A quantitative research technique was adopted in this study to explore the role played by academics and spin-off companies in

the process of technology creation and commercialization at UOT X. Structured questionnaires were designed and directly administered to the respondents to collect data related to technology creation and commercialization with special emphasis on the triggers and challenges that accompany the process. The argument for choosing a survey questionnaire was twofold.

Firstly, surveys provide quick, efficient and accurate means of assessing information about the population. Secondly, surveys are more appropriate in cases where there is a lack of secondary data. As Baruch and Holtom (2008) highlight, the majority of empirical studies conducted within the managerial and behavioral sciences utilize the quantitative methodology. Questionnaires become useful where individual perceptions and attitudes as well as organizational policies and practices are investigated (Baruch & Holtom, 2008).

To enhance validity and reliability the questionnaire adopted for this study had been tested in similar studies and obtained from the following sources: University of Minnesota, Harvard University (n.d.), University of Calgary (2013) and Holmes-Watts (2012).

3.2. Sample population. Internal research records from 2008 to 2013 were utilized to establish a database for the study. The database holds the list of academics that have university-industry research projects between 2008 and 2013. The established database was made up of academics who have been active and those that were non-active in terms of research as evident in their research outputs technology creation and transfer. A total of 52 academics were drawn from both the databases. Out of the 52 academics, 20 have been less active academics and 16 have been active.

A guide on how to complete the questionnaire was provided. Electronic survey questionnaires were distributed to all 52 academics for completion. After two reminders, a total of 36 were returned fully completed. Given that the outcome of any survey administered depends on the willingness of the respondents to complete the questionnaires, a 100% response rate is seldom achieved (Rogelberg & Stanton, 2007). Achieving a response rate of 70% in this study is considered fair for this type of surveys (Baruch & Holtom, 2009).

The SPSS version 22 program was used by the researcher to analyse the data. SPSS is software for performing statistical procedures in social sciences. Validity tests and reliability tests were performed and presented below.

Ethical consideration is a vital aspect of all research, especially in social sciences where human beings are involved. Ethical considerations refer to rules and regulations set by various responsible authorities to protect subjects under study from harm and abuse by different researchers (Welman & Kruger, 2001). For this study, the researcher assured the confidentiality of respondent's information. In line with this, the respondents were asked to make an informed choice to participate in the study without the use of cohesion or bribes. The objectives and the benefits of the study were clearly explained to the respondents prior to their participation, anonymity was ensured as respondents were not required to record their names and finally the researcher requested permission to carry out the research from relevant authorities (UoT X included). Thus, theresearch instrument (questionnaire) was submitted to the UoT X's ethics committee. Specifically, an agreement between the researcher, Technology transfer office and the Director of Research Department at UoT X was drawn focusing on confidentiality and protection of the research records made available to the researcher.

4. Results and discussion

4.1. Interest in academic entrepreneurship. The respondents were asked to rate their interest in academic entrepreneurship. The results displayed in Figure 1 indicate that 91% highly interested while 9% are not interested.

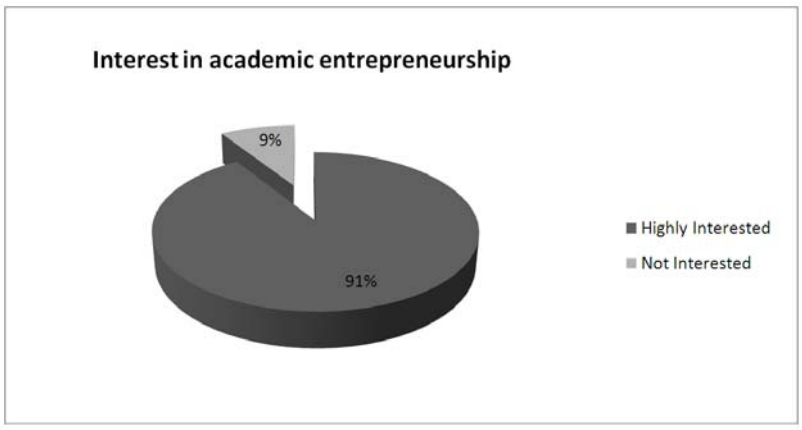

Fig. 1. Interest in academic entrepreneurship

4.2. Academic entrepreneurial culture. The respondents were asked to state the academic entrepreneurial culture in their faculties. According to the results reflected in Table 1 below, 11% of respondents indicated that their faculties have a high academic entrepreneurship culture while 50% of respondents stated that their faculties have semi or moderate academic entrepreneurship culture, and 39% of respondents indicated that their faculties have a weak academic entrepreneurial UOT X based on these results. On the basis of these results combined (61%) one may suggest that there is a positive attitude towards entrepreneurship.

Table 1. Respondent's academic entrepreneurial culture

		Frequency	Percent	Valid percent	Cumulative percent	Frequency
Valid	Weak culture	7	19.4	19.4	19.4	Weak culture
	2	7	19.4	19.4	38.9	2
	3	18	50.0	50.0	88.9	3
	High culture	4	11.1	11.1	100.0	
	Total	36	100.0	100.0		

4.3. Influences of producing an innovative product. The respondents were asked to state the factors that influence them to produce innovative products. According to the results displayed in Table 1, the majority of the respondents (47.2%) indicated that they were not that much influenced by availability of funding to produce an innovative product, while 27.2% of respondents indicated that they were highly influenced by the availability of funding in the past five years, and 16.1% of respondents indicated that availability of funding had a very low influence.

Table 2. Availability of funding

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Low influence	4	11.1	12.1	12.1
	2	2	5.6	6.1	18.2
	3	17	47.2	51.5	69.7
	High influence	10	27.8	30.3	100.0
	Total	33	91.7	100.0	Total
Missing	System	3	8.3		
Total		36	100.0		

4.4. Technology transfer offices (TTO). The respondents were asked to indicate how the university TTO had influenced them to produce innovative products. According to the results displayed in Table 3, 33.4% of respondents indicated that they were highly influenced by university TTO during the past five years to produce an innovative product, while 33.3% of respondents indicated that private companies had a low influence on them in the past five years. These are very interesting results because there is only 0.1 difference between those respondents that were influenced by TTO with those who were not influenced by TTO.

Table 3. Technology transfer office

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Low influence	9	25.0	37.5	37.5
	2	3	8.3	12.5	50.0
	3	2	5.6	8.3	58.3
	High influence	10	27.8	41.7	100.0
	Total	24	66.7	100.0	
Missing	System	12	33.3		
Total		36	100.0		

4.5. Technology transfer skills. This question was asked to gauge the participants' technology transfer skills. The results are displayed on Table 4, which indicates that 80% respondents consider themselves skilled enough to excel in technology transfer, while 16.6% of respondents consider themselves unskilled enough and 2.8% did not respond.

Table 4. Frequency distribution of respondents' technology transfer skills

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Not skilled enough	3	8.3	8.3	8.3

Table 4 (cont.). Frequency distribution of respondents' technology transfer skills

		Frequency	Percent	Valid percent	Cumulative percent
	2	3	8.3	8.3	16.7
	3	10	27.8	27.8	44.4
	Skilled enough	19	52.8	52.8	97.2
	22	1	2.8	2.8	100.0
	Total	36	100.0	100.0	

4.6. Academic entrepreneurial culture. The respondents were asked to state the academic entrepreneurial culture in their faculties. According to the results reflected on Table 5 below, 11% of respondents indicated that their faculties have a high academic entrepreneurship culture while 50% of respondents stated that their faculties have semi or moderate academic entrepreneurship culture and 39% of respondents indicated that their faculties have a weak academic entrepreneurial culture. On the basis of these results combined (61%) one may suggest that there is a positive attitude towards entrepreneurship.

Table 5. Respondent's academic entrepreneurial culture

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Weak culture	7	19.4	19.4	19.4
	2	7	19.4	19.4	38.9
	3	18	50.0	50.0	88.9
	High culture	4	11.1	11.1	100.0
	Total	36	100.0	100.0	

4.7. Personal passion for innovation. The respondents were asked to indicate whether personal passion had influenced them to produce innovative products. According to the results displayed in Table 6, a notable proportion (61.1%) of the respondents indicated that they were highly influenced by personal passion to produce an innovative product, while 13.9% of respondents indicated that personal passion had a low influence on them in the past five years.

Table 6. Personal passion for innovation

		Frequency	Percent	Valid percent	Cumulative percent
Valid	2	5	13.9	18.5	18.5
	3	4	11.1	14.8	33.3
	High influence	18	50.0	66.7	100.0
	Total	27	75.0	100.0	
Missing	System	9	25.0		
Total		36	100.0		

4.8. Faculty commercialization culture. In this section the participants were asked to indicate the influence of faculty commercialization culture on the production and commercialization of research output. The results in Figure 2 show that 66% of respondents indicated that their production of innovative product was influenced by a low faculty commercialization culture, 15% of respondents indicated high influence of commercialization faculty culture and 19% of respondents indicated that their production of innovative product was semi or moderately influenced by the faculty's commercialization culture.

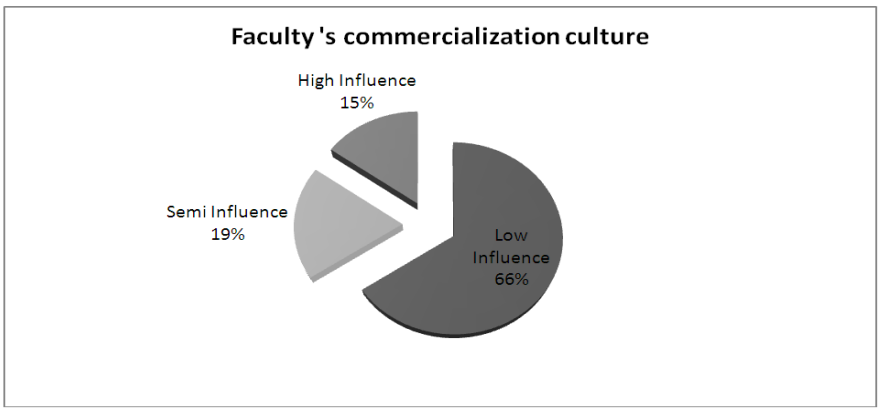

Fig. 2. Faculty commercialization culture

4.9. Entrepreneurial culture's influence on production of innovative product. Respondents were requested to respond to a question probing how their faculty entrepreneurial culture influenced their production of an innovative product. The results are displayed in Table 7. Only 32% reported a strong faculty entrepreneurial culture; the other 32% indicated a semi-strong faculty entrepreneurial culture, while 36% of respondents reported a very low faculty entrepreneurial culture. Combining these results (38.8%), one would suggest that the entrepreneurial culture at UoT X is not a very positive one.

Table 7. The influence of faculty entrepreneurial culture on respondents

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Low influence	3	8.3	13.6	13.6
	2	5	13.9	22.7	36.4
	2	5	13.9	22.7	36.4
	3	7	19.4	31.8	68.2
	High influence	7	19.4	31.8	100.0
	Total	22	61.1	100.0	
Missing	System	14	38.9		
Total		36	100.0		

5. Key findings and discussions

5.1. The factors that motivate academics to become involved in entrepreneurial activities. It has become important for universities to pay greater attention to identifying ways of creating wealth (Wright et al., 2004). In the past ten years, interest in academic entrepreneurship and the establishment of university spin-off companies has grown in South Africa.

Given that there is a growing body of literature on the push or pulls of entrepreneurship, one of the research questions was formulated to capture this aspect in the context of academics at UoT X. Combinations of questions were thus geared towards accomplishing this task. The results noted that pull factors tend to influence the entrepreneurial activities of academics at UoT X more than push factors. It was noted that:

- Approximately 91% (Figure 1) of the respondents were highly interested in academic entrepreneurship while only 9% were not.
- The culture of entrepreneurship within faculties also influenced others in engaging with entrepreneurial activities. Faculties with a higher culture of entrepreneurship saw more academics engaging with entrepreneurial activities. It is worth noting that the entrepreneurship culture at UoT X is weak. As Kirby (2006) notes, most academics view their roles as teachers and researchers, and not as entrepreneurs.
- University support for entrepreneurial activities was also instrumental in shaping and influencing entrepreneurial intentions. Funding, for instance, the availability of funding was noted to exert a positive impact on entrepreneurial intentions.
- Passion for research and innovation.

5.2. The role that academic entrepreneurs play in the process of technology transfer and commercialization at UoT X. According to Wood (2011), academic entrepreneurship requires the contribution, interaction, participation and collaboration of a number of participants not limited to academics. Actually, it involves a number of stakeholders and different activities that involve the TTO, faculty stakeholders, funding agency, industry, and other university stakeholders.

The study revealed that academics are the key players in the process of technology transfer, given that they initiate the process by turning ideas into innovative products that can be marketed. Passion and faculty entrepreneurial role models are important determinants and drivers of this process. Faculty academic entrepreneurs are very influential at faculty level because they provide postgraduate students and other researchers with information on how to start spin-offs and how to find venture capital.

Furthermore, academics initiate and maintain collaborations with private companies involved in the commercialization activities. Academics also become immersed in the process of technology transfer and commercialization through spin-off companies.

These results are further corroborated by the literature. For instance, Owen-Smith and Powell (2001) note that becoming an entrepreneurial university requires the participation and commitment of all faculties, with the entire technology transfer process predicated on individual faculty members revealing their inventions to the university. According to Lockett et al. (2003), the academic may run the spin-off company parallel with his/her academic duties because the involvement of the inventor may add positive value and knowledge to the technology. University professors can be considered as key persons in the transfer of technology and research-based know-how from the university setting to private enterprise.

Conclusions

The aim of this study was to establish the factors that inspire academics to engage in entrepreneurial activities and to identify the role that academic entrepreneurs play in the process of technology transfer and commercialization at UoT X. The results noted that pull factors tend to influence the entrepreneurial activities of academics at UoT X than push factors. Furthermore, it was revealed that academics are the key players in the process of technology transfer, given that they initiate the process by turning ideas into innovative products that can be marketed. For instance, the academics initiate, and maintain collaborations with private companies involved in the commercialization activities.

Passion and faculty entrepreneurial role models are noted as important determinants and drivers in this process. In the same direction it was highlighted that faculty academic entrepreneurs are very influential at faculty level because they provide postgraduate students and other researchers with information not limited to how to start spin-offs and how to find venture capital.

Limitation and scope for future studies

The first challenge had to do with the perceived low entrepreneurship culture at UoT X, which made the potential participants reluctant to participate in the study given that they do not see the importance of academic entrepreneurship. The second challenge was that of time-frame. UoT X academics have very busy work schedules, so the researcher had to send reminders regularly and the deadline for the survey had to be extended. Notwithstanding, the researcher managed to have 70% of responses.

Given the short comings of this study in terms of the scope and time constraints, this study has revealed areas that need further research in the field of academic entrepreneurship:

- A study may evaluate the state of faculties' entrepreneurship culture at UoT X.
- According to the respondents of this study there is a need for training on academic entrepreneurship, commercialization, and technology transfer and spin-off creation.
- There is a need for a study that can assess the benefits of offering entrepreneurship as a compulsory module for all university programs, this is also supported by Nicolaides (2011, p. 1048) entrepreneurship gives students a new way of looking at the world and that start-ups activity is one of the most important social activities for countries around the world.
- Yet another study may investigate whether academic entrepreneurship is rewarding.

References

1. Ács, Z.J. & Audretsch, D.B. (2003). *Handbook of entrepreneurship research: an interdisciplinary survey and introduction*, New York, NY: Springer.
2. Alessandrini, M., Klose, K. & Pepper, M.S. (2013). University Entrepreneurship in South Africa: Developments in Technology Transfer Practices, *Innovation: Management, Policy & Practice*, 15(2), pp. 205-214.
3. Ardchvili, A., Cardozo, R. & Ray, S. (2003). A theory of entrepreneurial opportunity identification and development, *Journal of Business Venturing*, 18(1), pp. 105-123, January.
4. Åstebro, T., Braunerhjelm, P. & Broström, A.B. (2013). Does academic entrepreneurship pay? *Industrial and Corporate Change*, 22(1), pp. 281-311.
5. Alvarez, S.A. & Busenitz, L.W. (2001). The entrepreneurship of resource-based theory, *Journal of Management*, 27(6), pp. 755-775, December.
6. Baldwin, R.B. & Blackburn, R.T. (1981). The academic career as a developmental process: Implications for higher education, *Journal of Higher Education*, 52(6), pp. 598-614.
7. Barbaroux, P. (2012). Identifying collaborative innovation capabilities within knowledge-intensive environments, *European Journal of Innovation Management*, 15(2), pp. 232-258.
8. Baruch, Y. & Holtom, B.C. (2008). Survey response rate levels and trends in organizational research, *Human Relations*, 61(8), pp. 1139-1160.
9. Braunerhjelm, P. (2010). Entrepreneurship, innovation and economic growth: past experiences, current knowledge and policy implications. Swedish Entrepreneurship Forum, Working Paper 2010, 02.
10. Co, M.J. & Mitchell, B. (2006). Entrepreneurship education in South Africa: a nationwide survey, *Education Training*, 48(5), pp. 348-359.
11. Derbew, Z., Mungamuru, N. & Asnake, Y. (2015). A review of university industry linkages for innovation and entrepreneurship development in the milieu of Ethiopia, *International Journal of Scientific Research*, 4(2), pp. 73-75, February.
12. Dottore, A., Baaken, T. & Corkindale, D. (2000). A partnering business model for technology transfer: the case of the Muenster University of Applied Sciences, *International Journal of Entrepreneurship and Innovation Management*, 12(2), pp. 1-27.
13. Doutriaux, J. (1987). Growth patterns of academic entrepreneurial firms, *Journal of Business Venturing*, 2(4), pp. 285-297, Autumn.

14. Eztkowitz, H. & Leydesdorff, L. (2000). The dynamic of innovation: from national systems and "Mode 2" to a triple helix of university-industry-government relations, *Research Policy*, 29(2), pp. 109-123, February.
15. Etzkowitz, H. (2003). Innovation in innovation: the triple helix of university – industry – government relations, *Social Science Information*, 42(3), pp. 293-337, September.
16. Gabrielsson, J., Politis, D. & Tell, J. (2012). University professors and early stage commercialization: an empirical test of the knowledge corridor theory, *International Journal of Technology Transfer and Commercialization*, 11(3-4), pp. 213-233.
17. Gambrel, P.A. & Cianci, R. (2003). Maslow's hierarchy of needs: does it apply in a collective culture? *Journal of Applied Management and Entrepreneurship*, 8(2), pp. 143-161, April.
18. Giacomin, O., Guyot, J.-L., Janssen, F. & Lohest, O. (2007). Novice creators: personal identity and push pull dynamics. CRECIS Working Paper 07/10, Center for Research in Change, Innovation and Strategy, Louvain School of Management, Université catholique de Louvain. Available at: https://www.uclouvain.be/cps/ucl/doc/iag/documents/WP_07-10_Franssen.pdf [28 July 2015].
19. Gibb, A.A. & Hannon, P. (2005). Towards the entrepreneurial university. Entrepreneurship education as a lever for change. Policy paper no. 3. Birmingham: National Council for Graduate Entrepreneurship (NCGE).
20. Harper, D.A. (2003). *Foundations of entrepreneurship and economic development*, London: Routledge.
21. Harvard University. Center for Education Policy Research. (n.d.). Available at: http://cepr.harvard.edu/files/cepr/files/anet-y2-school-teacher-survey-control.pdf [15 March 2013].
22. Herrington, M., Kew, J. & Kew, P. (2015). *2014 GEM South Africa report: South Africa at the crossroads – a goldmine or a time bomb?* Cape Town: Development Unit for New Enterprise (DUNE), Faculty of Commerce, University of Cape Town.
23. Hindle, K. & Yencken, J. (2004). Public research commercialization, entrepreneurship and new technology based firms: an integrated model, *Technovation*, 24(10), pp. 793-803, October.
24. Holmes-Watts, T. (2012). Letter of information: participants' consent to participate in research.
25. Holtz-Eakin, D., Joulfaian, D. & Rosen, H.S. (1994). Sticking it out: entrepreneurial survival and liquidity constraints, *Journal of Political Economy*, 102(1), pp. 53-75, February.
26. Johnson, P.S. & Darnell, A. (1976). New firm formation in Great Britain. Discussion paper no. 5. Department of Economics. Durham University, England.
27. Entrepreneurial universities in the UK: applying entrepreneurship theory to practice, *Journal of Technology Transfer*, 31(5), pp. 599-603, September.
28. Kloppers, J.P., Tapson, J., Bradshaw, D. & Gaunt, C.T. (2006). Improving Technology Transfer in developing countries, rd African Regional Conference on Engineering Education (ARCEE 2006), Pretoria. 26/27 September 2006. Available at: http://web.uct.ac.za/staff/gaunt/ARCEE06jpk_jct_db_ctg.pdf [Accessed 26 October 2013].
29. Kuratko, D.F. (2007). Entrepreneurial leadership in the 21st century (guest editor's perspective), *Journal of Leadership and Organizational Studies*, 13(4), pp. 1-11.
30. Kutinlahti, P. (2005). *Universities approaching market: intertwining scientific and entrepreneurial goals*. Espoo: VTT Technical Research Centre of Finland, National Technology Agency, Ministry of Trade and Industry. [Academic thesis, University of Helsinki].
31. Laredo, P. (2007). Revisiting the third mission of universities: toward a renewed categorization of university activities? *Organization*, 12, pp. 843-862.
32. Lin, B-W. (2003). Technology transfer as technological learning: a source of competitive advantage for firms with limited R&D resources, *R&D Management*, 33(3), pp. 327-341, June.
33. Lockett, A., Wright, M. & Franklin, S. (2003). Technology transfer and universities' spin-out strategies, *Small Business Economics*, 20(2), pp. 185-200, March.
34. Marimuthu, M., Arokiasamy, L. & Ismail, M. (2009). Human capital development and its impact on firm performance: evidence from developmental economics, *Journal of International Social Research*, 2(8), pp. 265-272, Summer.
35. Markman, G.D. & Baron, R.A. (2003). Person-entrepreneurship fit: why some people are more successful as entrepreneurs than others, *Human Resource Management Review*, 13(2), pp. 281-301.
36. Meyer, M. (2003). Academic entrepreneurs or entrepreneurial academics? Research-based ventures and public support mechanisms, *R&D Management*, 33(2), pp. 107-115, March.
37. Mitchell, R.K. (2011). Increasing returns and the domain of entrepreneurship research, *Entrepreneurship Theory and Practice*, 35(4), pp. 615-629, July.
38. Mpako-Ntusi, T. (2003). The role of research administration in the transformation of higher education in South Africa. Paper presented at the Society of Research Administrators (SRA) Symposium, Pittsburgh, PA, 18-22 October.
39. Nicolaides, A. (2011). Entrepreneurship – the role of higher education in South Africa, *Educational Research*, 2(4), pp. 1043-1050, April.
40. Owen-Smith, J. & Powell, W.W. (2001). To patent or not: faculty decision and institutional success at technology, *Journal of Technology Transfer*, 26(1-2), pp. 99-114, January.
41. Park, J.S. (2005). Opportunity recognition and product innovation in entrepreneurial hi-tech start-ups: a new perspective and supporting case study, *Technovation*, 25(7), pp. 739-752, July.

42. Perkmann, M. & Walsh, K. (2007). University-industry relationships and open innovation: towards a research agenda, *International Journal of Management Reviews*, 9 (4), pp. 259-280.
43. Rasmussen, E.A., Moen, O. & Gulbrandsen, M. (2006). Initiatives to promote commercialization of university knowledge, *Technovation*, 26(4), pp. 518-533, April.
44. Rogelberg, S. & Stanton, J. (2007). Understanding and dealing with organizational survey non-response, *Organizational Research Methods*, 10, pp. 195-209.
45. Rothaermel, F.T., Agung, S.D. & Jiang, L. (2007). University entrepreneurship: a taxonomy of the literature, *Industrial and Corporate Change*, 16(4), pp. 691-791.
46. Schjoedt, L. & Shaver, K.G. (2007). Deciding on an entrepreneurial career: a test of the pull and push hypotheses using the panel study of entrepreneurial dynamics data, *Entrepreneurship Theory and Practice*, 31(5), pp. 733-752, September.
47. Shore, C. & Mclauhlan, L. (2012). 'Third mission' activities, commercialization and academic entrepreneurs, *Social Anthropology*, 20(3), pp. 267-286.
48. Simpeh, K.N. (2011). Entrepreneurship theories and empirical research: a summary review of the literature, *European Journal of Business and Management*, 3(6), pp. 1-8.
49. 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), pp. 63-76.
50. Slaughter, S. & Leslie, L.L. (1997). *Academic capitalism: politics, policies, and the entrepreneurial university*, Baltimore, MD: Johns Hopkins University Press.
51. Ssebuwufu, J., Ludwick, T. & Béland, M. (2012). *Strengthening university-industry linkages in Africa: a study on institutional capabilities and gaps*, Accra, Ghana: Association of African Universities (AAU).
52. Staber, U. & Bögenhold, D. (1993). Self-employment: a study of seventeen OECD countries, *Industrial Relations Journal*, 24(2), pp. 126-137, June.
53. South Africa. Ministry of Education. (2001). *National plan for higher education*, Pretoria: The Ministry of Education.
54. South Africa. Ministry of Education. (2004). *A new funding framework: how government grants are allocated to public higher education institutions*, Pretoria: Ministry of Education.
55. South Africa. Department of Education. (1996). *Green Paper on higher education transformation*, Pretoria: DoE.
56. South Africa. Department of Education. (1997). *Education White Paper 3: a programme for the transformation of higher education*, Pretoria: DoE.
57. University of Calgary (2013). Survey information/implied consent template. Available at: https://www.ucalgary.ca/research/researchers/ethics-compliance/chreb [26 July 2013].
58. Van Rijnsoever, F.J., Hessels, L.K. & Vandeberg, R.L.J. (2008). A resource-based view on the interactions of university researchers, *Research Policy*, 37(8), pp. 1255-1266, September. Pretoria: Tshwane University of Technology, pp. 41-51.
59. Viale, R. & Etzkowitz, H. (2010). The capitalization of knowledge: a triple helix of university-industry-government. Cheltenham: Edward Elgar.
60. Welman, J.C. & Kruger, S.J. (2001). *Research methodology for the business and administrative sciences*, 2nd ed. Cape Town: Oxford University Press.
61. Wilson, R.A. (2007). Technology transfer in South African public research institutions. In Krattinger, A. et al. (eds). *Intellectual property management in health and agricultural innovation: a handbook of best practices.* Oxford: MIHR; Davis, CA: PIPRA, pp. 1651-1658.
62. Wright, M., Binks, M., Lockett, A. & Vohora, A. (2003). *Survey on university commercialization activities: financial year 2002.* Nottingham: Nottingham University Business School.
63. Wright, M., Birley, S. & Mosey, S. (2004). Entrepreneurship and university technology transfer, *Journal of Technology Transfer*, 29(3-4), pp. 235-246, August.
64. Wood, M.S. (2011). A process model of academic entrepreneurship, *Business Horizons*, 54(2), pp. 153-161, March-April.
65. Zakaria, S. & Yusoff, W.F.W. (2011). Transforming human resources into human capital, *Information Management and Business Review*, 2(2), pp. 48-54, February.
66. Zimmerer, T.W. & Scarborough, N.M. (2004). *Essentials of entrepreneurship and small business management*, 4th ed. Upper Saddle River, N.J.: Pearson Prentice Hall.
67. Philpott, K., L. Dooley, L. O'Reilly, C. & Lupton, G. (2010). The entrepreneurial university: examining the underlying academic tensions, *Technovation*, 31, pp. 161-170.
68. Vernon, J. (2010). The end of the public university in England. Global Higher Ed. Available at: https://www.insidehighered.com/blogs/globalhighered/the_end_of_the_public_university_in_england (accessed 08/08/15).