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Factors in the Commercialization of Scientific Research in Zimbabwean Universities

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Abstract

Low university patents and the lack of spin-out companies resulting from university research indicate Zimbabwe's low level of academic entrepreneurship. The purpose of this article is to determine the factors that affect academic entrepreneurship and understanding how these elements affect academic entrepreneurship in Zimbabwean university research commercialization. The study used a qualitative methodology, and data were collected through semi-structured interviews with twelve scientists who were purposively sampled and employed by Zimbabwean universities.

The results indicate a deficiency in business acumen, motivation to participate, collaborative culture, and supporting structures. These were determined to be the main obstacles preventing research from being commercialized. However, the industry is not prepared to split the profits from commercialized research output, and disparities in how universities and industry view innovation also impede research commercialization. For the successful and efficient commercialization of research, the study suggests that innovation hubs have a clear administrative structure. Researchers should be encouraged to participate in the research commercialization process by implementing a recognition award system. Innovation hubs ought to hire specialists in intellectual property matters and coordinators for university-industry cooperation on research projects.

Keywords: Academic entrepreneurship, Intellectual property, Research commercialization

1. Introduction

As universities in Zimbabwe work to comply with the objectives of the Education 5.0 strategy with newly added pillars to their purpose of innovation and industry, research commercialization has become crucial. According to Pichyangukura, Keerati-angkoon, and Chandrachai (2011), research commercialization is the process of transferring innovations to the industry through IP licensing and spin-off. University research commercialization paves the way for societal and economic advancement (Pichyangukura, Keerati-angkoon, & Chandrachai, 2011). Regarding the commercialization of university research, the importance of academic entrepreneurship cannot be understated.

Starting from this consideration, the goal of this study is to identify obstacles that prevent scientific research at Zimbabwean universities from being commercialized and to identify methods for enhancing this process. In order to determine which factors whether they be national or regional have the greatest influence on academic entrepreneurship and how these factors are affected by regional or national contexts, Davey, Rossano, and van der Sijde (2015) conducted a regional study involving 33 European

countries. The research conducted by Pichyangukura, Keerati-angkoon, and Chandrachai (2011) adds to our knowledge of the drivers of and obstacles to the profitable commercialization of scientific research in Thailand. This implies that less developed countries should adapt to setting explicit context mechanisms rather than just replicating the systems, tools, designs, and exercises used in developed countries. These countries likely face unique challenges that have not yet been documented in research on university barriers and drivers (Davey, Rossano & van der Sijde, 2015). By focusing on the obstacles and motivators mentioned in earlier research (Pichyangukura, Keerati-angkoon & Chandrachai, 2011; Rasoanaivo, 2012; Alessandrini, Klose & Pepper, 2013; Davey, Rossano & van der Sijde, 2015), this study contributes to the body of literature for a developing nation Zimbabwe

The study aims to identify obstacles to scientific research commercialization in order to propose strategies for enhancing scientific research commercialization in Zimbabwean universities. As a result, the study advances our understanding of the problems associated with research commercialization and the strategies for removing obstacles to this process. This study facilitates appropriate policy implementation by providing university leadership with valuable insights into the factors that influence and hinder the commercialization of scientific research.

2. Barriers to research commercialization

In their analysis of 33 European nations, Davey, Rossano, and van der Sijde (2015) distinguished between the elements that promote academic entrepreneurship as drivers and impediments. Academic entrepreneurship is synonymous with the commercialization of licensed innovation from university resources (Davey, Rossano & van der Sijde, 2015). It is defined as an academic's participation in entrepreneurial activities notwithstanding their regular academic obligations and research (Louis et al., 1989). This research accepts the hurdles and drivers of academic entrepreneurship as being the same for commercialization, treating academic entrepreneurship and commercialization as equivalent.

Several obstacles to technology transfer to industry have been found through studies. Among these are university professors' theoretical applicability, their lack of business expertise, and their entrepreneurial skills despite their high level of research and teaching proficiency (Franklin, Wright & Lockett, 2001). Researchers in South Africa are not aware of the benefits of commercializing their work, as Alessandrini, Klose, and Pepper (2013) revealed. As the link between academia and business, academics must balance traditional academic responsibilities with entrepreneurial endeavors (Davey, Rossano & van der Sijde, 2015).

According to Mascarenhas, Ferreira, and Marques (2018), transition-related roadblocks, cultural differences between academia and industry, and differences in industry and university operations are the main sources of barriers to research commercialization (Pichyangukura, Keerati-angkoon & Chandrachai, 2011; Davey, Rossano & van der Sijde, 2015). Universities, on the other hand, are eager to release the findings before the intellectual property has been protected, in contrast to industry (Hall, Link & Scott, 2001).

Finding the right contacts for first consulting within university structures is a challenge for industry (Davey, Rossano & van der Sijde, 2015). Universities lack the human resources necessary to supervise and evaluate technology transfer efforts (Alessandrini, Klose & Pepper, 2013). They also have inexperienced staff members and a lax intellectual policy (Pichyangukura, Keerati-angkoon & Chandrachai, 2011). According to Rasoanaivo (2012), some of the major challenges facing Africa in relation to patent matters are: (i) citizens of Member States having limited knowledge and information

about patents; (ii) believing that patents are too complicated and are therefore only for developed countries; and (iii) realizing that patents are more of a barrier than a tool.

Technology transfer is hindered by a lack of seed funding and financial support from universities and the government (Pichyangukura, Keerati-angkoon & Chandrachai, 2011; Alessandrini, Klose & Pepper, 2013; Davey, Rossano & van der Sijde, 2015). The potential benefits of academic entrepreneurship have been viewed as being thwarted by an award structure that does not intend to promote academic entrepreneurship (Jones-Evans, 1997) and a lack of incentives for researchers (Pichyangukura, Keerati-angkoon & Chandrachai, 2011).

3. Motivators for enhancing the commercialization of research

The literature has demonstrated how important it is to consider the factors that influence research commercialization. Pichyangukura, Keerati-Rangoon, and Chandrachai (2011) identified four factors that contribute to the commercialization of innovation: the ability to obtain capital, the capacity to adapt innovation, the ability to use IP and license to apply innovation, and the alignment between the research division and industry. Alessandrini, Klose, and Pepper (2013) emphasized the need for devoted advocates to effectively communicate the outcomes of intellectual property, pursue patents, and be proactive in identifying possible IP. Research departments should provide information, educate users, hold academic conferences or seminars, and train researchers and students to apply skills that meet user needs through consulting and contracting research (Pichyangukura, Keerati-angkoon & Chandrachai, 2011). They should also establish the best means of interacting with researchers and students and train researchers and students to recognize when data becomes intellectual property (Alessandrini, Klose & Pepper, 2013).

Academics' social connections with businesspeople can help combat the lack of human resources needed to pursue prospects for academic advancement (Birley, 1985). Research from Columbia University and Stanford University looked at 11 case studies and found that, with the exception of one, the researchers involved in spin-off creation were members of a research team that also included industry experts (Colyvas et al, 2002). Research commercialization is facilitated by relationships between educational institutions and industries, according to Pichyangukura, Keerati-angkoon, and Chandrachai (2011).

The following three factors are highlighted by Diamant & Pugatch (2007) as having an impact on how effective the technology transfer process is: (i) profit sharing from intellectual property rights within university structures; (ii) TTO expected returns; and (iii) relationships between universities, industry, and government. According to Alessandrini, Klose, and Pepper (2013), institutional top management support and well-established TTOs, along with other work environments that foster entrepreneurship and innovation, have a significant impact on technology transfer.

Another factor that has been found to influence participation in academic entrepreneurial activities is financing (Wilson, 2012). According to Alessandrini, Klose, and Pepper (2013), this implies that there must be enough incentives for those with the requisite skills to enable technology transfer. Commercialization is driven by the unique motivations of university professors (Pichyangukura, Keerati-angkoon & Chandrachai, 2011). Thus, it has been discovered that linking obstacles to the forces that motivate academics can help them overcome what seem to be roadblocks to academic entrepreneurship (Bruneel et al, 2011).

4. Methodology used

Data was collected from in-person and phone structured interviews with purposefully selected scientists

from various universities in order to learn about the obstacles and solutions to enhancing research commercialization in Zimbabwean universities. When dealing with a small sample size, a purposive or judgment sampling technique makes sense (Pichyangukura, Keerati-angkoon & Chandrachai, 2011). Academic researchers were chosen from various Zimbabwean universities. After interviewing twelve candidates, data saturation was attained. Nvivo software was used to record, interpret, and analyze interviews.

5. Results

5.1 Challenges hindering commercialization of scientific research in Zimbabwean Universities

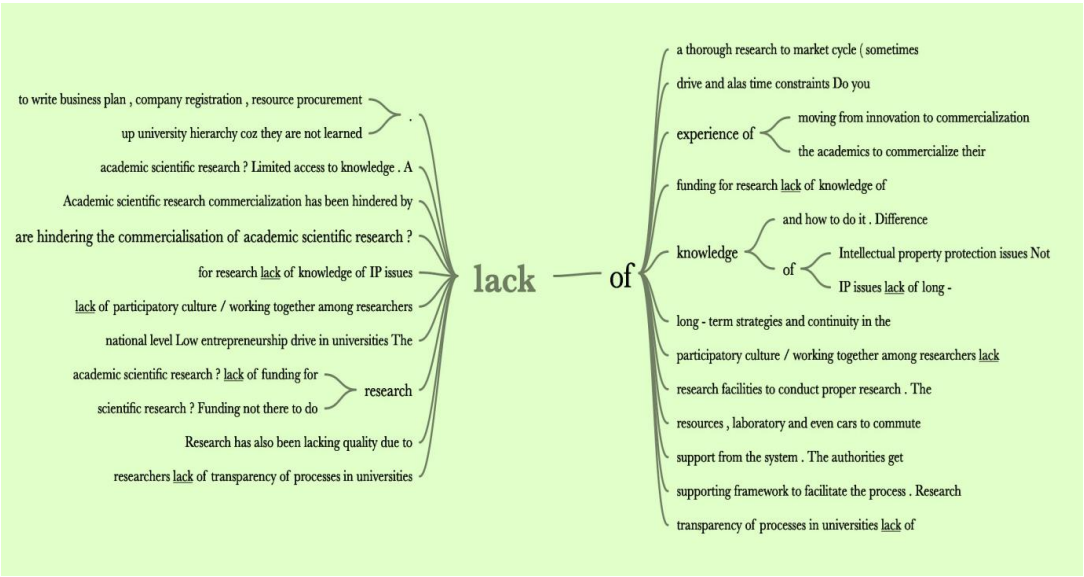
All twelve interviewees responded to this question. Below is a word cloud containing their responses. Two themes that emerged involved the terms "industry" and "lack." These are thoroughly and independently investigated below.

Figure 1: Word cloud containing themes related to obstacles to research commercialization

5.1.1 Lack of Theme

The dominant theme emerged as the word lack. Seven out of the twelve interviewees mentioned it more than once. Below is the word tree yield for the Lack of theme.

Figure 2: Word tree output of Lack of theme from challenges hindering the commercialization of research



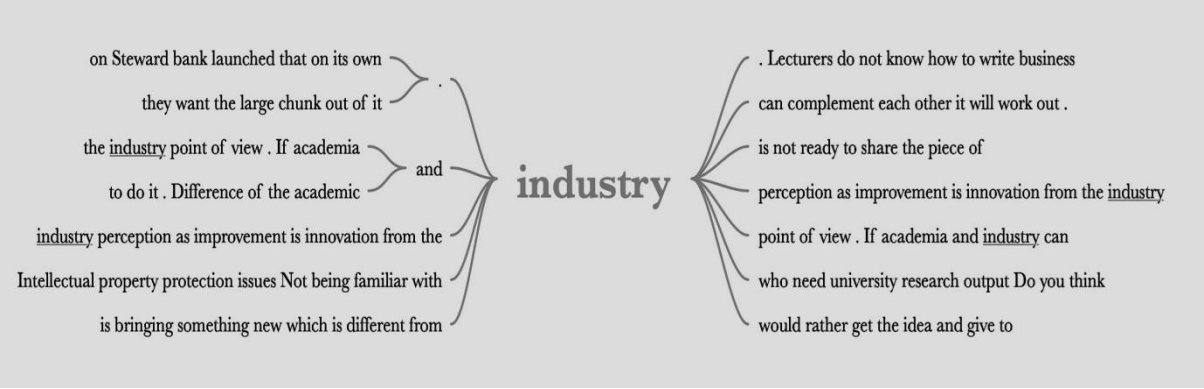
The respondents emphasized a lack of knowledge regarding the following: writing business plans; company registration; procurement; intellectual property (IP) issues; funding; a collaborative and

participatory culture among researchers; the transparency of university processes; the quality of research; the examination of the market cycle (from innovation to commercialization); the motivation of researchers; time constraints; long-term strategies and continuity; the availability of facilities for conducting appropriate research (laboratory, vehicles for commuting); and system support (no supporting structure).

5.1.2 Industry theme

The second most frequently mentioned theme, "industry," was brought up by three interviewees a total of seven times.

Figure 3: Word tree output of Industry theme from challenges hindering the commercialization of research



The accompanying featured issues on industry included: industry's reluctance to share the benefits of innovation because it wants to reap the benefits more personally; industry's perception of innovation differs from academic perspective, which views innovation as novel discovery; industry's search for industry needing university research outputs; and industry's unwillingness to invest resources in intellectual property issues.

5.2 Strategies for enhancing the commercialization of scientific research at universites in Zimbabwe

5.2.1Word cloud containing strategies to improve scientific research's commercialization

To this question, all twelve interviewees gave their responses. Below is a word cloud with their exact responses.

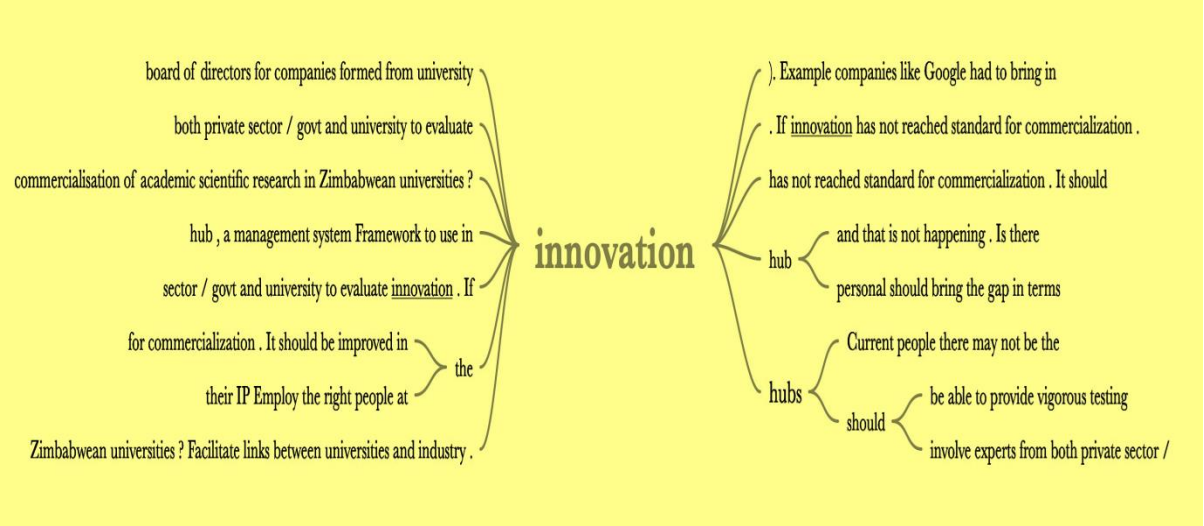
Figure 4: A word cloud with topics about ways to make scientific research more commercially viable

Their exact responses revealed three main themes: industry, people, and innovation. Each of these topics is covered separately below.

5.2.2 Innovation theme

Of the interviewees, four mentioned the innovation theme. That was the main idea. The word tree output that follows demonstrates how they used the theme in their exact answers.

Figure 5: Word tree produced by the Innovation theme on improvements for scientific research commercialization

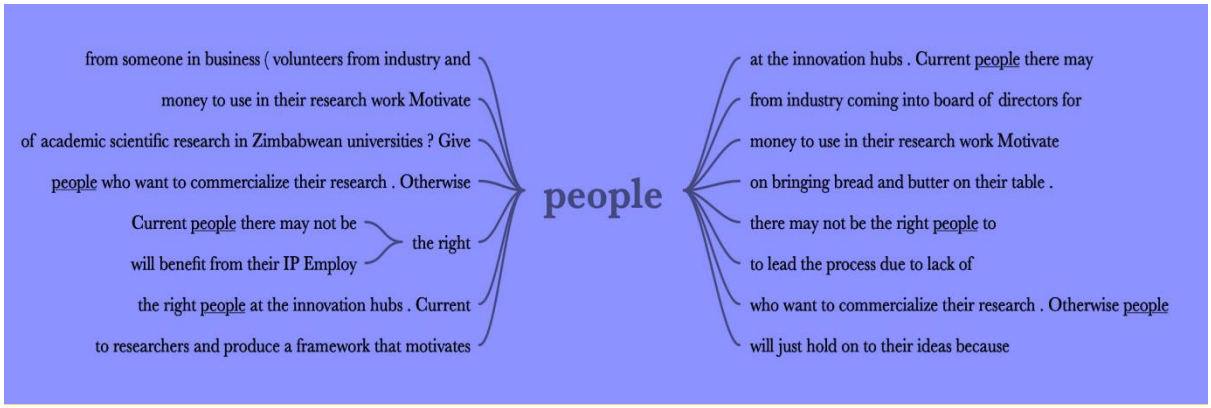


The four factors that contributed to the improvement of innovation were as follows: (1) the board of directors of snip-off companies should be composed of representatives from both industry and universities (e.g., Google hired industry experts to assist them); (2) industry, government, and universities should collaborate to evaluate innovation; (3) a clear administrative framework structure should be used in innovation hubs; and (4) innovation hubs should offer rigorous product testing.

5.2.3 People theme

Another top theme that emerged was to do with people. Additionally, it was brought up eight times by multiple interviewees. The result of the word tree is shown below.

Figure 6 Word tree output of People theme on improvements for commercialisation of scientific research



The word tree yield revealed the following;

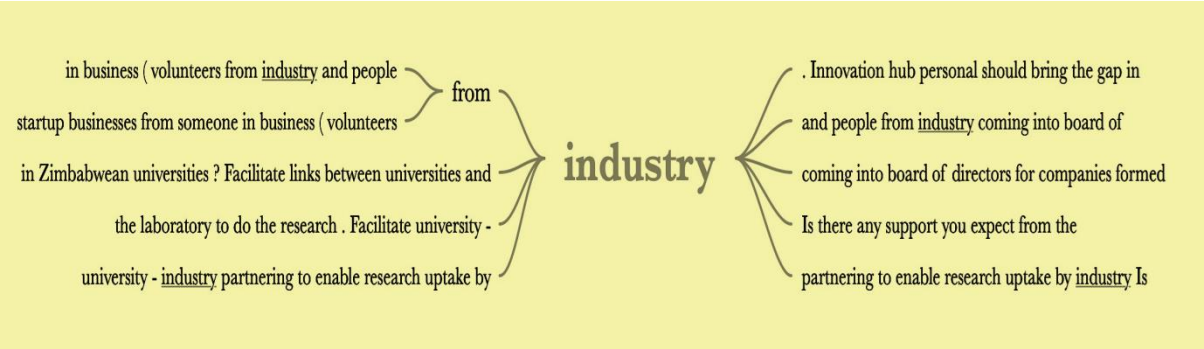
1. Financial funding is necessary for researchers to conduct their study.
2. Universities and industry experts should work together on research projects.
3. Individuals with expertise in intellectual property matters ought to be hired.
4. There should be a suitable commercialization structure in place to inspire researchers.

5. It is appropriate to provide rewards for research efforts.
6. Commercialization advocates need to address the bread and butter problems.

5.2.4 Industry theme

The word tree below illustrates the industry theme, which came out as the third most talked-about theme.

Figure 7 Word tree produced by the industry theme on enhancements for scientific research commercialization



The following issues were brought to light by the word tree: (1) include industry personnel in research projects; (2) establish links between universities and businesses to encourage industry adoption of research; and (3) innovation hub employees should serve as a liaison for any disputes arising between businesses and universities.

6. Synopsis and conclusion

This study examined the obstacles to and enablers for the successful commercialization of scientific research. Twelve academic scientists were chosen from Zimbabwean universities and participated in semi-structured interviews. Lack and industry were found to be the two main obstacles. The inability to write a business plan, the knowledge of registering a company, the knowledge of procurement, the knowledge of intellectual property issues, the culture of cooperation and participation among researchers, funding, high-quality research, the transparency of university processes, the drive of researchers, time constraints, long-term strategies, and continuity, the lack of facilities for conducting proper research (laboratories, vehicles for commuting), and the lack of systemic support (no supporting structure) are among the things that are lacking. In their analysis of Thai universities, Pichyangukura, Keerati-angkoon, and Chandrachai (2011) confirm that two major obstacles to research commercialization are researchers' lack of business expertise and their lack of connections to the industry. Research commercialization in the USA and Japan is hampered by a lack of seed funding, according to the literature (Nilsson, Fredin & Serger, 2006).

The second obstacle to research commercialization, according to this study, is the industry, which is unwilling to share the spoils because it wants to gain more from innovation. Academics see innovation as new discovery, while industry sees it as an improvement. Finding industries in need of university research output is necessary. The industry is not prepared to invest in intellectual property problems. Research confirms that universities' management of the commercialization process is impacted by the informational and cultural divide that exists between industry and academia (Nilsson, Fredin & Serger, 2006).

This study makes it abundantly evident that there are factors that encourage research commercialization and make it more successful and efficient. People, industry, and innovation were found to be the three main drivers of research commercialization.

It is clear that in order for the commercialization process to succeed, the researchers who generate the innovation must be acknowledged. This can be done by providing funding for their research, honoring them with awards, and addressing the day-to-day problems that affect them. Nilsson, Fredin, and Serger (2006) had previously emphasized this as a suggestion for China. The study's conclusions also advise the university to hire staff members with specialized knowledge of intellectual property and to involve experts from the industry in the research process. The same opinion is echoed by Alessandrini, Klose, and Pepper (2013), who state that dedicated advocates are needed to communicate the outcomes of intellectual property, pursue patents, and actively look for possible IP.

7. Pointers for additional investigation

Only university-based science-based research commercialization was covered in this study. To better understand the obstacles and facilitators of research commercialization, more studies should be conducted for other academic fields and other postsecondary educational establishments such as polytechnics.

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