The Factors that Influence University Academic Performance on Research Commercialization in Zimbabwe

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Abstract

This study focuses on the effect of factors that influence academic performance on research commercialisation with the theory of planned behaviour as guidance to the influence of attitudes, subjective norms and perceived control. The article is based on cross sectional survey data gathered from different academic scientists in Universities in Zimbabwe. Data was gathered from a stratified random sampling of 269 scientists across the universities. The paper argued that academic researchers' intention to commercialize research is strongly influenced by benefit derived from the engagement.

The study recommends that universities should focus on addressing the individual financial and benefits motivational factors and the subjective norm of recognition in order to enhance commercialisation of academic research in Zimbabwe. Further comparative analysis with other African countries is recommended.

Key words: Academic entrepreneurship, commercialisation, scientists, theory of planned behaviour.

1.0 Introduction

Research has shown that the role of academics in the commercialisation process is very significant as they hold the tacit knowledge and know the benefits of IP license of their invention (RSM PACEC, 2018). Studies have shown that the quality and characteristic of academic entrepreneur is one of the contextual factors that affects the commercialisation process (Hayter 2013; Perkmann et al. 2013; Siegel and Wright 2015). Most of the studies on academic entrepreneurship has tackled the subject from an institutional point of view, highlighting institutional level factors as royalty share, culture and management, lack of TTO awareness, science parks and business incubators as factors that affect commercialisation of research (Cullin, Calitz & Chetty, 2020), tensions and conflicts in commercialisation among academic entrepreneurs (Moilanen, Montenen & Eriksson, 2021). However, at the best knowledge of the author few theoretical frameworks have been proposed to analyse the individual factors (micro factors) affecting the academic entrepreneur engagement in commercialisation process. Few empirical studies have investigated the effect of academic engagement (contracting and consulting) on research commercialisation (Shi & Ge, 2018). Miranda, Chamorro-Mera and Rubio (2017) study of Spanish Universities was on factors that influence academic intention to create spin-off. Moreover, most of the researches are institutional case studies in South Africa (Cullin, Calitz & Chetty 2020), in Finland (Moilanen, Montenen & Eriksson, 2021) and in China (Shi & Ge, 2018). However, this research is not a one-institution study but covers universities throughout Zimbabwe. Building on these premises, the objective of the research is to evaluate the effect of the factors that influence academic performance on research commercialisation of scientific research in Zimbabwean universities. The paper explores how the theory of planned behavior explodes the factors that influence academic performance on research commercialization by looking at academic scientists' intentions, subjective norms and perceived behavioral control.

This study gives insight to university leadership on individual factors that affect the entrepreneurial scientist on research commercialisation, thus facilitates appropriate policy implementation. The Ministry of Higher Education is also enlightened on measures to take to enable research commercialisation thereby contributing to the attainment of Zimbabwe's vision 2030 of becoming a middle-level economy. Commercialisation process will be made easy for academic researchers in the universities as issues affecting them are addressed.

2.0 Literature Review

2.1 Theory of planned behaviour

The theory of planned behaviour was developed by Ajzen (1991), which posits that one's intention to act is governed by their beliefs, perception and other external factors. People embark on entrepreneurial journey motivated by attitude, subjective norms and perceived behavioural control (Linan et al, 2011). Attitude is the viewpoint of the intention by the individual, subjective norm is the confidence the individual has on perception of others towards their engaging in a particular behaviour and Perceived Behavioural Control (PBC) is the extent the individual has jurisdiction over the behaviour (Norman & Conner, 2017). The theory of planned behaviour demonstrates the intentions and behaviours in various

areas of study (Miranda, Chamorro-Mera & Rubio, 2017; Doanh et al, 2021). In light of this theory, this paper evaluates the influence of academic researcher on commercialisation of research. Researchers' intention to commercialise research is governed by their perception. Krueger et al, 2000, avers that intention is a yardstick to individuals' behaviour. The benefits derived from the task such as financial reward and recognition drives the individuals' intentions. This was affirmed by Huyghe and Knockaer (2015) that scientists at universities that compensate research produce elevated degrees of spin-off and patenting. Academics see a wide assortment of advantages (status, contacts, monetary incomes or academic affirmation) of participating in entrepreneurial exercises (Davey, Rossano & van der Sijde, 2015). Aldridge, Audretsch and Sander (2011), tracked down that social capital largely affected scientist researcher inclination to be enterprising. Subjective norm governs entrepreneurs' decision on how others perceive their behaviour towards research commercialisation contributed by the recognition they get from the university. In other words, the opinion of social groups like family and companions determines whether the individual ought to participate in the behaviour (Chantson & Urban, 2018). Perceived behavioural control bring out the ability of individual to control the outcomes that is how easy it is to performing the task

2.2 Academic entrepreneurship

Academic entrepreneurship is defined as new companies (spin-offs) established through exploiting Intellectual property in an academic institution (Shane, 2000). This is the same definition of the term entrepreneurial scientist given by Etzkowitz (1998) as someone who sees the commercial and intellectual potential of results. Academic entrepreneurship studies has been divided into three levels, macro level deals with national policies and support systems, meso level deals with university and business support and micro level deals with social and individual aspects (Djokovic & Souitaris, 2008: Moilanen, Montenen & Eriksson, 2021). Micro level also known as individual level where financial benefits payoff for patents granted and revenue share from commercialised research determines researchers' participation at individual level (Cullin, Calitz & Chetty 2020). This study focuses on the micro level in relation to how both macro (national) and meso (institutional) level affect micro (individual) level. Previous research on individual level has focused more on factors that encourage academic entrepreneurship (D'este & Perkmann, 2011; Lam, 2011) as financial gain, academic recognition, and tenure, gender and group identity. A two-year study with repeated interviews was done on three Finnish scientists with an aim of linking commercialisation activities with research (Moilanen, Montonen & Erikkson, 2021). Conflicting perceptions of academic scientist within the research group influenced the way the entrepreneurial scientist commercialisation with the junior scientist being more pro-active towards research commercialisation. Nevertheless, existing literature on micro (individual) level and the intentions of the academic researcher to commercialise research is not well defined thus will be explored in this research. The following hypothesis proposed to test the influence of academic researcher on commercialisation of research

H1: Academic scientific researcher has a positive influence on research commercialisation.

3.0 Methodology

Cross sectional survey study that collects data from at least two cases at a point (Bryman, 2012) is adopted for this study. Stratified random sampling is adopted as academic scientist are divided into faculty strata's of Science, Agriculture, IT, Engineering and Medicine. Information on academic scientist is obtained from the different university websites or from the relevant university authorities. Questionnaire is administered either online or physically to the selected scientists.

4.0 Results

4.1 Analysis of results for academic scientific researcher's effect on research commercialisation

Academic scientific researcher's effect on research commercialisation (independent variable) was measured on eight factors as indicated in table 1. Researcher's intention factor was measured from researcher's perception, researcher's financial motivation, and researcher's use inspired research. Researchers' subjective norms was measured by the following factors; academic recognition, researcher's fear of disclosure, perception of influence of Incubation Hub and Technology Transfer Office. Researchers' behavioural control is measured by their position at the university.

Table 1 Results for academic scientific researcher's effect on research commercialisation

Item Code	Item Description	Mean score	Mean response	SD
D4.24	Academic scientific researcher's perception determines participation in research commercialization	4.53	Agree	0.516
D4.25	Academic scientific researcher's financial motivation increases participation in research commercialization	5.0	Strongly Agree	0.0
D4.26	Academic scientific researcher's use inspired research determines research commercialization	4.33	Agree	0.488
D4.27	Academic scientific researcher's position at university determines research commercialization	4.05	Agree	1.265
D4.28	Academic scientific researcher's fear of disclosure and trust determines research commercialization	3.20	Neutral	0.640
D4.29	Academic scientific researcher's academic recognition determines research commercialization	4.47	Agree	0.458
D4.30	Academic scientific researcher's perception on the influence of incubation hub determines research commercialization	4.13	Agree	0.990
D4.31	Academic scientific researcher's perception on the influence of Technology Transfer Office determines research commercialization	3.71	Agree	1.007
	Overall	4.18	Agree	0.671

Source: Research data (2021)

The results imply that academic scientific researcher's intentions, subjective norms and perceived behavioural control influence research commercialisation as indicated by the researchers agreeing to these effects. However, the academic researchers were not clear as to whether the fear for disclosure and trust affects research commercialisation.

4.2 Analysis for level of commercialisation of scientific research

Table 2 shows the dependent variable (research commercialisation) was measured using the seven factors.

Table 2 Results for level of commercialisation of scientific research at the universities

Item Code	Item Description	Mean score	Mean response	SD
A1.1	University houses Technology Transfer Office (TTO)	3.55	Agree	0.987
A1.2	University houses Incubation hub	4.01	Agree	1.012
A1.3	University houses Industrial park	3.62	Agree	0.804
A1.4	Government funding is available	3.91	Agree	0.714
A1.5	Industry funding is available	3.7	Agree	1.02
A1.6	University has commercialized scientific researcher's work	2.5	Neutral	1.30
A1.7	I have commercialized my own research work	3.67	Agree	1.25
	Overall	**3.566**	**Agree**	

Source: Research data (2021)

Scientific researchers agree to the fact that there is commercialisation of research work in the universities in Zimbabwe. However, the researchers are neutral as to the role of university in commercialising their research work. The standard deviation is measuring the amount of variation of the responses. The low standard deviation values of 1.30 and below indicates that the responses of the respondents are close.

4.3 Scale validation

Structural equation modelling to test research hypothesis was performed using SPSS® version 21 and AMOS® version 21. Prior to the hypothesis testing consistency reliability of data was tested using explorative factor analysis (EFA) and Cronbach's alpha.

4.3.1 Reliability analysis

Reliability of constructs shown in Table 3 ranges from 0.77 to 0.779 which is more than 0.63 minimum recommended by Nunnally and Bernstein (1994). This concludes reliability of the data collected in the survey

Table 3: Construct, Number of Items and Cronbach's (α)

Construct	Number of Items	Cronbach's alpha (α)
The state, forms and levels of commercialisation of scientific research at the university	7	0.770
The effect of academic scientific researcher on commercialisation of research	8	0.779

4.3.2 Exploratory factor Analysis (EFA)

Exploratory factor analysis groups, interrelate correlated variables prior to statistical treatment (Mohd Matore et al, 2020). Factor with loadings below 0.4 were not presented

since they were suppressed. Item A1.4 was dropped due to poor factor loadings minimum cut off point of 0.4 as recommended by Chan & Idris (2017).

Table 4: Factor loadings

Construct	Items	Factor Loadings
The state, forms and levels of commercialisation of scientific research at the university	A1.1	0.58
	A1.2	0.61
	A1.3	0.48
	A1.4	
	A1.5	0.75
	A1.6	0.63
	A1.7	0.45
The effect of academic scientific researcher on commercialisation of research	D4.24	0.44
	D4.25	0.67
	D4.26	0.53
	D4.27	0.48
	D4.28	0.69
	D4.29	0.71
	D4.30	.82
	D4.31	0.63

4.3.3 Standardized factor loadings and critical ratios

Table 5 presents standardised factor loading and critical ratios. The results show that all standardised factor loadings were above 0.6, which is considered as the least possible standard for factor loadings (Bagozzi & Yi, 1988). Critical ratios were significant at $p < 0.001$.

Table 5: Standardised factor loadings and critical ratios

Construct	Items	Factor Loadings	critical ratios
The state, forms and levels of commercialisation of scientific research at the university	A1.1	0.67	
	A1.2	0.74	7.128***
	A1.3	0.45	11.362***
	A1.4	0.61	14.201***
	A1.5	0.55	8.231***
	A1.6	0.83	3.971***
	A1.7	0.58	14.671***
The effect of academic scientific researcher on commercialisation of research	D4.24	0.73	
	D4.25	058	12.361***
	D4.26	0.63	9.654***
	D4.27	0.67	14.387***
	D4.28	0.57	21.364***
	D4.29	0.63	13.224***
	D4.30	0.72	15.214***
	D4.31	0.69	17.325***

4.4 Testing research hypothesis

Research hypotheses H1, was tested using structural equation modelling in AMOS to determine the relationship of the variables.

4.4.1 Research Hypotheses

H1: Academic scientific researcher has a positive influence on research commercialisation.

4.4.2 Results of Hypotheses testing H1

Hypotheses	Hypothesised Relationship	SRW	CR	Remark
H1	Academic Scientific Research → Level of Commercialisation	0.358	3.610***	Supported

Notes: SRW standardized regression weight, CR critical ratio, ** significant at p < 0.05, *** significant at p < 0.001,

5.0 Discussion and Conclusion

Prior entrepreneurial studies were on finding relationship between contextual factors (normative and regulatory support) and scientist intention to commercialise research on a meso level (institutional) in Vietnam (Doanh et al, 2021). In this study, we focus on micro (individual) level factors pertaining to the academic scientist intentions, subjective norms and perceived behavioural control effect on research commercialisation.

Researchers intention factor was measured from researcher's perception, researcher's financial motivation, and researchers use inspired research. The results from the study indicated a positive influence on commercialisation as researchers agreed to that effect. Researchers' intention to commercialise positively affect commercialisation. Researchers' subjective norms was measured by the following factors; academic recognition, researcher's fear of disclosure, perception of influence of Incubation Hub and Technology Transfer Office. The researchers are neutral on the fear of disclosure meaning the fear to disclose governed by the influence of others does not have a direct impact on commercialisation. The recognition the researchers get from others, the incubation hub and technology transfer office has a positive effect on research commercialisation. Researchers' behavioural control is measured by their position at the university. The position of the researcher at the university has a positive effect on research commercialisation as this impact on the power the researcher has in controlling the outcome of their research work.

This research has practical implications both for universities, management, and policy makers in the adoption of adequate measures to enable academic scientific researchers commercialise their research. However, the research has limitations for future investigations. The generalisation of the research to the Zimbabwean context cannot be adopted for countries with different local context. This calls for a comparative analysis with other African countries (South Africa and Nigeria) who are also on the forefront of commercialising academic research.

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