

From Science, Technology and Innovation to Creativity, Innovation and Entrepreneurship Indicators' Framework for the Academic Promotion with Impact on Socio-Economic Development

Vusumuzi Malele

Department of Science and Innovation, Brummeria, Pretoria, SOUTH AFRICA.

ABSTRACT

Science, Technology and Innovation research and development publications are not the entire picture of promotional indicators for an academic. We live in the era of creativity, innovation and entrepreneurship whereby issues of socio-economic development are vital. In this regard, the notion of promoting academics based on their length of service and number of research publications as promotion indicators should be a thing of the past. This paper uses secondary data to explore the indicators that are used for academic promotion at the South Africa universities; then proposes the indicators for academic promotional purposes. It uses those indicators to contribute a framework for the promotion of socio-economic development by academics. It concludes by proposing a two-way approach in an academic promotion namely: promotion focusing on (i) research and development, community engagement, and teaching components; and (ii) teaching, creativity, innovation, and entrepreneurship. Qualifications (Q), Work/Teaching experience (T), Research and Development experience (R), Community Engagement experience (C), and Professional Bodies Membership (P). The latter indicator forms the QTRCP indicator framework.

Keywords: Academic promotion, Indicators, Science, Technology and Innovation, Creativity, innovation and entrepreneurship.

Correspondence

Vusumuzi Malele

Department of Science and Innovation
DST Building 53, CSIR Campus, Meiring
Naude Road, Brummeria, Pretori-0001,
SOUTH AFRICA.

Email id: vusimalele@gmail.com

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INTRODUCTION

The main findings of the 2019 South African Science, Technology and Innovation (STI) indicators report that South Africa's experienced an increase of 7% in the number of scientific publications per million inhabitants between 2017 and 2018.^[1] Furthermore, under Science, Technology, Innovation Landscape (STIL) human capital development, South Africa matches other upper middle-income countries in terms of the production of formal qualifications but lags behind in the deployment, development and know-how, as most of these human capital particularly researchers were not employed by the business sector.^[1]

The Global Innovation Index (GII) ranks the innovation performance of countries and economies around the world, based on 80+ indicators. In 2019, in the world, the GII ranked South Africa in number 67 compared to 58 in 2018, and first within Sub-Saharan Africa, followed by Kenya and then

Mauritius. In 2020, the within Sub-Saharan Africa the GII ranked South Africa and Mauritius (with Mauritius ranked above South Africa with wide significant data variability as compared to 2019) first innovative countries followed by Kenya and then Tanzania.^[2]

Does this mean the South African innovation actors have dropped the ball when it comes to entrepreneurship and innovation, or does it mean other countries have improved their game, as a result South Africa dropped its ranking? Does it mean that the produced human capital does not have business related skills such as entrepreneurship and innovation? Does it mean those who train such human capital need to be promoted based on a robust indicators framework that will also emphasise socio-economic development related skills?

Regardless of how the latter is viewed, the major question is how the South African innovation ranking could be improved. At least through this paper a solution is provided. Since one of the innovation actors in South Africa is its universities, then an investigation into indicators that are used to measure the promotional values of academics form an important discussion.

Against this backdrop, this paper answer the following research question "What are the main indicators that

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influence or are used for academic promotion in South African Universities of Technologies (UoTs)?” In this regard, this paper explores the indicators that are used for academic promotion at the South Africa universities; then proposes the STI to Creativity, Innovation and Entrepreneurship (CIE) indicators for academic promotional purposes. It uses those indicators to contribute a framework for the promotion of socio-economic development by academics. It concludes by recommending how the framework could be utilised.

Literature Framework

To answer the question “What are the main indicators that influence or are used for academic promotion in South African Universities of Technologies (UoTs)?” It is important to describe some few terms that could build the indicators that this advocates for.

Creativity, Innovation and Entrepreneurship

Creativity is the capability or act of conceiving something original or unusual.^[3] Malele^[4] define creativity as the idea or ability to make or otherwise bring into existences something new (i.e. new solution or new method/model or new device or new artistic object/ form). The Business News said the key factor is that creativity remains an idea not reality yet; and it is very specific to people since animals have no way to communicate ideas (www.businessnewsdaily.com).

Innovation is a process of transferring new ideas to satisfy the end-users.^[5,6] Okpara^[7] defined innovation as the creation of new value. Furthermore,^[4] (2018) described innovation as involving the exploitation of creative ideas to make some specific and tangible difference in the lives of a specific or different communities.

Entrepreneurship is an interdisciplinary field which integrates the knowledge and methods from different disciplines with the aim of identifying and exploiting markets that might need the entrepreneurs’ (a person doing business) product. Its major tool is Innovation; while innovation is a function of the combination of ideas, creativity and invention.

The concept of CIE could be described as a platform that integrates creativity (C), innovation (I) and entrepreneurship (E) to produce products and services that excels and grow within the community or markets when one or more tasks of either C or I or E changes positively. For example, the more creative an individual becomes the more innovative outputs could be obtained and the greater the chances of enterprising those outputs. In this regard, entrepreneurship excels when innovation grows and innovation excels when creativity grows; the more ideas the more creativity.

CIE Universities

Current literature talks a lot more about entrepreneurial university.^[8-11] Entrepreneurial university is that university that uses technology licensing or business creation by researchers as the main forms of transferring the results of academic research to address socio-economic challenge.^[8,9] Entrepreneurial university is a knowledge and innovation actor that is key to competitiveness, stimulation of economic growth and wealth creation in today’s globalized world.^[11]

Thorpe^[12] said the entrepreneurial university is not (i) a trade school designed to train students how to start or run a commercial activity; (ii) an entrepreneurial university does not involve the wholesale adoption of methods and values from the commercial world; (iii) an entrepreneurial university is not merely an assembly line for the creation of new companies; and (iv) entrepreneurial universities are not economic development authorities. The role of universities stretches beyond generating technology transfer through patents, spin-offs and start-ups as it encompasses wider roles such as contributing and providing leadership for creating entrepreneurial thinking, actions, institutions and entrepreneurial capital.^[13]

Thorpe^[12] sees the entrepreneurial university as (i) recognizes that liberal arts education is fueled by innovation, (ii) thrives on big problems, (iii) values both innovation and execution, (iii) places culture ahead of structure, and (iv) encourages partnerships between academics and entrepreneurs. In this regard, this paper moves from the entrepreneurial university framework to contribute other aspects such as creativity and innovation to begin describing the CIE University.

Malele^[4] argued that for the university to be CIE in nature, it should move away from only embracing the three traditional core functions of the university to four-core-functions. As illustrated in Figure 1, the current three core functions of the university are: (i) teaching/learning, (ii) research and development, and (iii) community engagement. The four core functions are: (i) research and development (development of knowledge), (ii) teaching and learning (the transfer of knowledge), (iii) community engagement (the application and consumption of knowledge) and (iv) entrepreneurship and innovation (the application and exploitation of knowledge and ideas).

If the four-core-functions are embraced in the university strategy, they will begin to shape the university towards becoming the CIE University which will provide a shape for indicators that could be used for different purposes in this case academic promotion. Furthermore, they could help the CIE University to contribute to the socio-economic development of its host country and perhaps its host region.

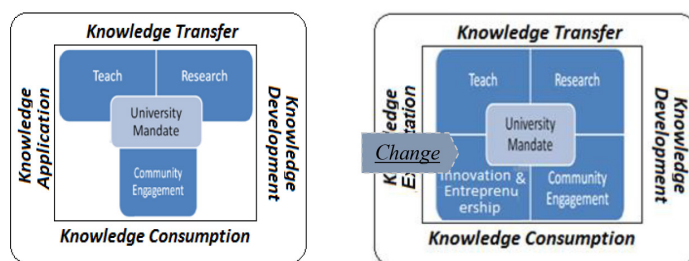


Figure 1: From three-to-four core functions of the (Source: [4]).

Universities are in the knowledge-business, their STI are tools that can contribute to a path of sustained development.^[13] Unfortunately, academic promotions at the universities have mostly depended on the STI indicators such as academic's length of service, number of research publications, number of students supervised and graduated. The universities need to look beyond STI indicators for promotions. Universities need to promote their academics based on the outcomes of the relevant indicators, since creativity and proactive problem-solving chant this era's agenda.^[14]

Universities need to begin looking at academic CIE with relevance to socio-economic development. Academic CIE for socio-economic development is the ability by the academic to create, innovate, commercialise and enterprise new prototype/products/services created from ideas, challenges and opportunities emanating from socio-economic environment. The CIE university embraces indicators that would allow successfully translation of the STI and CIE activities and outputs into addressing socio-economic issues.

Academic Promotional Indicators

There is always a need to balance promotional scale in most higher education institutions. According to,^[15] 80% of lecturers at institutions of higher learning were keen on engaging in use-oriented research while 71% of the sampled tutors were adequate with treating patentable inventions as refereed articles, and only 20.3% of faculty members disagreed with rewarding faculty for patentable inventions in tenure decisions. The latter, 20.3% might be a pool of those who are needed in South African universities in order to move the universities from their traditional three core function to four functions.

Malele^[4] argues that for addressing socio-economic issues such as unemployment, universities should not ignore CIE as their fourth function. The latter is supported by^[15] who highlighted a changing demand on academia to expand the research enterprise beyond basic research towards contributions to economic development. Social and economic development could be enhanced if universities produce essential number of human capital and stimulate regional innovation.^[16]

Most indicators of academic promotions depended heavily on the human capital theory. Human capital theory, also known as a theory of earnings, explains both individuals' decisions to invest in human capital (education and training) and the pattern of individuals' lifetime earnings – starting out low (when the individual is young) and increase with age.^[17] As^[4] and^[16] argued that CIE is the new indicator needed for academic promotion, and an element that should be included in theory. The CIE links well to the economic concept suggesting that human desires and unlimited wants foster ever-increasing productivity and economic growth; and this could perpetually increase people's pursuit of profit.^[18]

There is a national and international recognition of the importance of innovation, technology transfer and entrepreneurship for sustained economic revival, and the role that research universities can play.^[4,15] In this regard, this paper adopts a literature framework that sees an individual as being concerned with – and uses – knowledge and experiences to generate CIE outputs such as new inventions, and establishment of new small businesses. As such, it could promote the number of small-scale business owners or entrepreneurs, in this case emerging from the academic environment. Universities that adopt such thinking are mainly known as CIE Universities.

METHODOLOGY

This paper adopted exploratory research approach to answer the following research question: “What are the main indicators that influence or are used for academic promotion in South African Universities of Technologies (UoTs)? Exploratory research is undertaken when the researcher requires insight into an issue and there are few or no earlier studies that can be referred to.^[19] Kumar^[20] notes that exploratory research allows an individual accept new ideas and unusual thoughts; then change the course or focus of research to align with those ideas. This is because exploratory researchers are keen to learn about the new possibilities in the given field of study.^[4] The latter can help in determining the best methods to be used in a subsequent study.

According to^[4] three techniques are used to carry out an exploratory research: (i) survey of individuals, (ii) study of secondary data, and (iii) analysis of selected case studies. This paper used (i) and (ii); for example, in choosing the participants for surveying individuals, stratified random sampling and university web search for procedures or guidelines for the appointment and promotion of academic staff were used.

This paper emanates from the work that was conducted during a doctoral study that used the South African public UoTs as the sampling frame.^[4] In this regard, five of the six South African UoTs provided ethical clearance to conduct the study. Hence, survey of individuals (20 university staff

members) for this paper was drawn from the UoTs and the secondary data was drawn from 13 of the 26 South African public universities.

RESULTS, ANALYSIS AND DISCUSSION

This paper aimed at answering the following research question: “What are the main indicators that influence or are used for academic promotion in South African Universities of Technologies (UoTs)?”

Finding from the survey of individuals

A telephone survey interview asking “What are the main indicators that influence or are used for academic promotion in the South African Universities of Technology” was conducted with at least 56 UoTs’ staff members (6 administrators/manager, 10 Junior Lecturers, 10 Lecturers, 10 Senior Lecturer, 10 Associate Professors, and 10 Full Professors). The latter was conducted from the UoTs because the ethical clearance was obtained from such universities.

The interview analysis revealed that there is a general understanding that the main indicators that influence or are used for academic promotion in South African Universities are: (i) Qualifications, (ii) Professional Bodies Membership, (iii) Teaching experience, (iv) Supervision experience, (v) Research and Development experience, and (vi) Community Engagement experience. These indicators are summarised as Qualifications (Q), Work/Teaching experience (T), Research and Development experience (R), Community Engagement experience (C), and Professional Bodies Membership (P). The latter indicator form what term the QTRCP indicator framework (which is illustrated in see Figure 2).

Of note is the fact that some (especially full professors) mentioned that innovation outputs such as patents, copyrights and trademarks can also be used as promotional indicator towards full professorship. Clearly, the interviews agreed with the thinking of^[18] about the fact that the promotions of academics is favourably linked to the human capital theory. Secondly, the interviews showed that the CIE indicators were not generally understood as part of the main indicators that are used as promotional indicators. Thus, creating the need for inclusion of such indicators for promotional purposes.

Findings from the secondary data

South Africa comprise a total of 26 public universities with immersed history that categorised them into: (i) traditional universities, (ii) UoTs (mostly in industrial hubs) and (iii) historical disadvantaged institutions (HDIs) (mostly in rural areas). Since there was no need for ethical clearance for obtaining and analysing secondary data because secondary data is drawn from public documents; then, 13 (50%) of the 26 South African public universities were sampled of which four

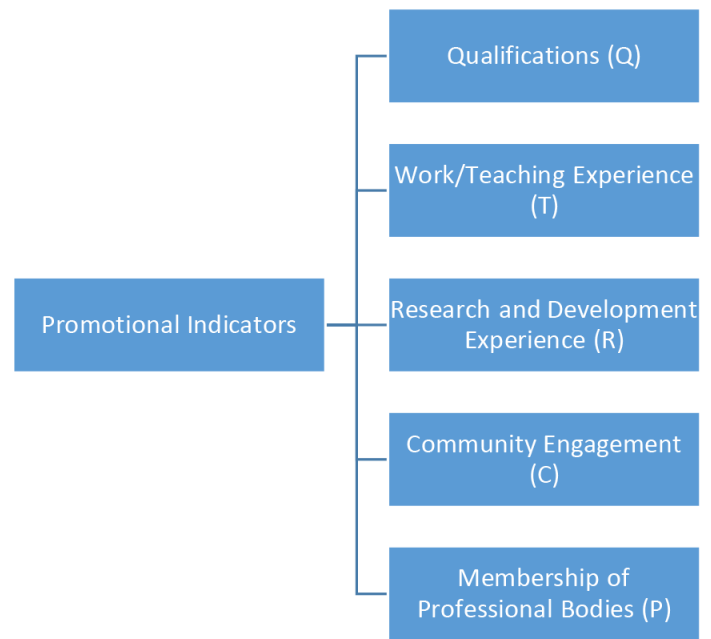


Figure 2: The QTRCP indicator framework (Source: Author).

were traditional universities, six UoTs and three were HDIs). The data was collected from searching universities policies, frameworks, procedures or guidelines for the appointment and promotion of academic staff. Table 1 below reflects the average findings of the sampling exercise. The table was adapted from the Tshwane University of Technology (TUT) promotional scorecard but it includes the analysis and findings obtained from the data collected from other universities scorecards, policies, frameworks, procedures or guidelines for the appointment and promotion of academic staff. It reflects the current patterns for the promotion of academic staff in South African public universities. Of much concern is the fact that the main indicators that influence or are used for academic promotion in South African UoTs seems to concur with the findings of the interview survey particular the fact that the appointment and promotion of academic staff follows the indicators of human capital theory thinking (see the QTRCP indicator framework, Figure 2).

Applicants are normally not promoted to other levels if they do not satisfy, the QTRCP indicator framework as illustrated in Figure 2. In most cases during the evaluation process for promotions, the QTRCP indicators are weighted using a scale specified by the university. Each university has its own scale which is guided by the university policy and could be benchmarked on that university’s focal strength. In this regard, a Full Professor in university A, could be an Associate Professor in University or versus visa.

Unfortunately, the QTRCP indicator framework is a one dimensional promotional framework as it does not cater for academics with high-level of CIE stature. The indicators for

Table 1: The average promotional indicators for academics adapted from the findings of the sampling exercise (with TUT scorecard used).

	Junior Lecturer	Lecturer	Senior Lecturer	Associate Professor	Professor
National Qualification Framework Level	NQF 8	NQF 9	NQF 9 or NQF 10	NQF 10	NQF 10
Qualification	Honors	Masters	Masters or Doctorate	Doctorate	Doctorate
Teaching/Supervision Experience	1yrs+ At least 1 course	3yrs+ At least 2 courses	5yrs+ At least 3 courses. At least 1 curriculum development/design task At least two postgraduate students' supervision and/or graduation. Assessor/examiner of at least 1 master's and 1 PhD thesis.	7yrs+ At least 4 courses At least 2 curriculum development/design task. At least 5 masters students and at least 2 PhD students' supervision and/or graduation. At least 2 Post-Doc Fellows mentored. Assessor/examiner of at least 3 master's and 3 PhD thesis.	10yrs+ At least 5 courses At least 3 curriculum development/design task. At least 3 Post-Doc Fellows mentored. Assessor/examiner of at least 5 master's and 5 PhD thesis.
Research and Development Experience	At least 1 peer reviewed Conference proceedings/presentations/invited talks. None	At least 2 peer reviewed Conference proceedings/invited talks. At least 1 peer reviewed journal papers (in accredited journal).	At least 5 peer reviewed Conference proceedings/ presentations/invited talks. At least 5 peer reviewed journal papers (in accredited journal). At least 1 Chapter in a book or 1 book reviews. At least 1 book and 1 journal editorial role.	At least 10 peer reviewed Conference proceedings/presentations/invited talks. At least 15 peer reviewed journal papers (in accredited journal), and at least 5 non-accredited journal articles. At least 2 Chapters in books or 2 book reviews. At least 2 book and 2 journal editorial roles. At least 1 sole author of a book. At least 1 artistic outputs, patents, etc).	At least 15 peer reviewed Conference proceedings/ presentations/invited talks. At least 25 peer reviewed journal papers (in accredited journal). At least 3 Chapters in books or 3 book reviews. At least 3 book and 3 journal editorial roles. At least 1 sole author of a book. At least 1 artistic outputs, patents, etc).
Community Engagement	Development or establishment or Participation in 2 community projects	Development or establishment or Participation in 2 community projects	Development or establishment or Participation in 2 community projects	Development or establishment or Participation in 2 community projects	Development or establishment or Participation in 2 community projects
Professional Membership	None	At least one	At least one	At least two	At least three

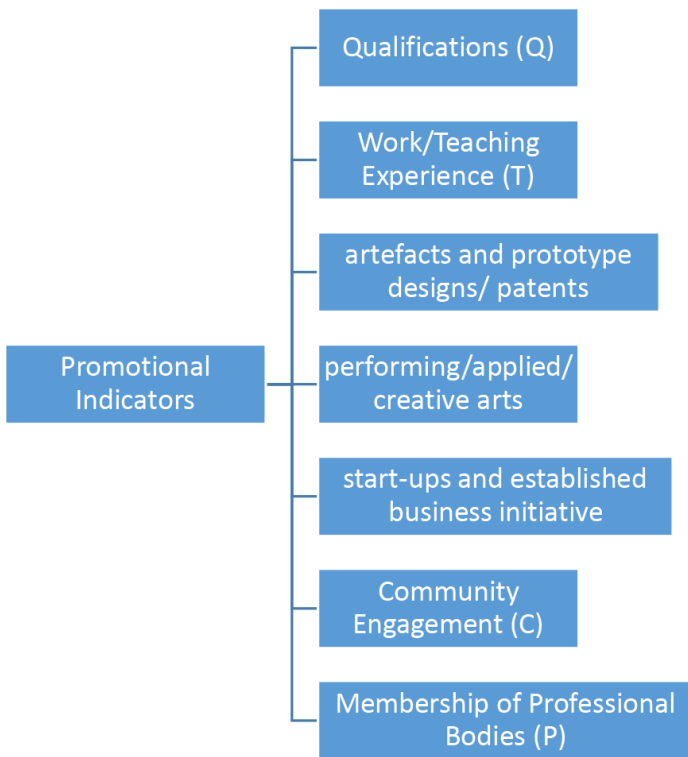


Figure 3: The QTCIECP indicator framework (Source: Author).

such academics are different from the QTRCP framework; they include performing/applied/creative arts, artefacts and prototype designs, start-ups and established business. This paper proposes an adapted QTRCP framework to QTCIECP framework as illustrated in Figure 3.

The QTCIECP indicator framework embraces candidate's qualifications, work/teaching experience, the CIE activities, community engagement/impact, and the recognised professional membership. Just like in the QTRCP indicator framework, these indicators are weighted and could be benchmarked according to the university policy using some industry or professional bodies standards. The indicators should then afford the academic to be promoted at the different levels that are illustrated in Table 1. For example, if the university emphasis the establishment of start-ups as key indicators for full professorship, the candidate with the capabilities of establishing start-up with at least two evidence should be afford a status of a full professor if other QTCIECP indicators are satisfied. However, for such a candidate the other CIE indicators should not be as high because the candidate could not be in the performing/applied/creative arts or artefacts and prototype designs but be profound start-up or business establisher who is bases at the university. In this regard, the university could be able to establish university-based companies which could afford students opportunities of being employed while studying. On the other-hand, the performing/applied/creative arts or artefacts and prototype

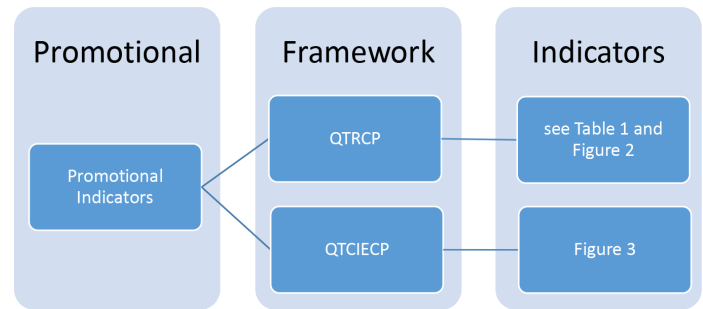


Figure 4: The two-pronged approach to academic promotion for a CIE university (Source: Author).

designs/patents could be the vital indicator than start-up or business establishment. The latter will make that university to be a CIE University; perhaps specialising in start-up/business establishment or performing/applied/creative arts or artefacts and prototype designs/patents. Indeed, the CIE University might specialise in patents only; in this regard, it will have to partner with other organisation(s) to address socio-economic issues and have socio-economic impact.

This paper proposes a two-way approach in academic promotion. The approach is summarised in Figure 4. It suggests that with other indicators appearing on both routes, the first approach should emphasise research and development as its benchmark for promotion; and the second approach should emphasise creativity, innovation, and entrepreneurship as the benchmark for promotion. If the academic promotion framework (in Figure 4) is implemented well, it is assumed that the university will become a CIE university which embraces both the R&D and innovation value chain. In this case, most of the R&D of that university could be exploited into different CIE outputs, and the correct calibre of academic could be employed and work together, creating a balanced innovation ecosystem. This ecosystem, will embrace the four core functions of the university; therefore, moving the university from STI-based university to the CIE university which has a strong base on STI.

CONCLUSION

This paper adopted an exploratory research approach in an attempt to answer the following question: "What are the main indicators that influence or are used for academic promotion in South African Universities of Technologies (UoTs)?" In this paper, it was shown that the current promotional framework needs not only to consider STI indicators for promotional purposes but also embrace CIE indicators. Since, this paper used exploratory research approach, it is envisaged that a number of research projects or papers that will be investigated and build the robustness of the contributed framework. One of the paper's limitations is the fact that only UoTs where

sampled and secondary data was used. Hence, this provides an opportunity for conducting a further study that could include all other universities and also collect data through questionnaires or interviews.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

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