

Research activities in open distance learning - an engineering perspective

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ABSTRACT: Generally, there is a conception that there are fewer research activities at institutions at which engineering is taught through distance learning. The aim of this article is to discuss how research activities are conducted in the school of engineering at a South African university offering engineering programmes in an open distance learning model. There has been a concern that engineering is the youngest school at the university and that the research output is limited. This article seeks to explore and understand the reasons for these non-expected results from the School of Engineering. These reasons are explored by means of baseline data and a questionnaire. According to the questionnaire, it was found that the majority of staff members do not have postgraduate qualifications and are also subjected to heavy work overload. The study shows that few research papers were presented at conferences compared to the journal research papers published. Furthermore, through this study, it was found that the majority of staff are unable to engage in research activities due to limited time (the burden of administrative work). In addition, generally in an open distance learning environment, there are more administrative duties when compared with conventional universities.

Keywords: Research output, engineering research, open distance learning, on-line learning

INTRODUCTION

The University of South Africa (UNISA) has been labelled one of the world's mega- open and distance learning (ODL) universities; UNISA plays a significant role in contributing towards the pool of academic offerings to the people in South Africa, as well as to a large extent in other Southern African development community (SADC) countries. Beginning to use computers in classrooms and schools has shown a great revolution in the field of training. With such technological developments, the classical class environment composed of books, notebooks, blackboards and chalk is being replaced by more modern educational environments. Information and communications technologies (ICTs) are powerful tools for empowerment and income generation in less developed countries (LDCs).

UNISA is made up of colleges, which are divided into schools. Each school comprises one or several departments in which various qualifications are offered. This study has been conducted in the College of Science, Engineering and Technology (CSET), which is made up of three schools; namely, the School of Computing (SOC), the School of Engineering (SOE) and the School of Science (SOS). It is generally accepted that faculties/schools of engineering produce fewer research outputs compared to other faculties/schools. This notion that research output is less in engineering from institutions that offer learning in the ODL mode compared to other faculties is influenced to some extent by studies conducted to find out if that was so. Interest in this question began when institutions started offering engineering at distance institutions.

Traditionally, distance education was only for fields of study that are less technical in nature, requiring less hands-on experience including laboratory experimentation and workshop practice. This has changed since the introduction of engineering courses at distance institutions. Engineering was introduced to UNISA at the time of the merger with Technikon SA and other institutions of distance learning in 2005. Technikon SA was started in 1956 to offer technical qualifications, mainly focusing on learners that could not attend higher education institutions because of work commitments [1]. These are mainly people already working in engineering fields that needed to improve/upgrade their academic qualifications, without necessarily having to stop meeting their work commitments [2].

Engineering research is of importance not only for members of staff in terms of their own advancement as academics and to universities as a source of revenue from government support, but also in improving the quality of education from the institutions, in industry by solving real problems in the manufacturing world and also to governments due to

improved national economies when industry experiences improvements due to productive research activities. It has been noted that engineering research involves acquisition of new knowledge and its application in creating new products, and that it is becoming more complex with inter and multi-disciplinary aspects.

METHODOLOGY

A questionnaire survey was conducted among the academic staff members of the School of Engineering in order to take snapshots of their research profile from 2011 to 2014. The aim of this questionnaire was also to get staff views on various aspects of research and research activities. The School of Engineering has employed a permanent lecturing staff of 54, including junior lecturers, lecturers, senior lecturer and professors. The questionnaire was handed to only 60% of the total staff members of the School of Engineering, and more than 83% completed and returned their questionnaire. The questionnaire was taken from Weerasekera [3].

RESULTS AND ANALYSIS

The questionnaire was used to analyse the results based on the information provided by the participants. Below are the questions that were used to find out why research output is low in the School of Engineering at an ODL university.

Reasons for the Poor Publication Record in the School of Engineering

In this area, the participants were asked to suggest why there is poor performance of research output in the School of Engineering. As shown in Figure 1, in their responses, 28.26% of the participants (not labelled) cited that the major reason for poor performance in research output is that there is too much administrative work during the day. This means that there is lack of time to do any other work including research work due to the heavy administrative workload. Following this reason, the participants felt that there were many other reasons that contributed to the poor performance of research output. Other reasons accounted for about 22%. Furthermore, 10.87% of the participants cited that the reason for poor research output performance was due to the difficulty of undertaking engineering research and 10.87% also cited that they were more conscious of the quality of the papers and not the number of papers produced. A high percentage of the respondents felt that research was low because of too much administrative work (28.26%), and because it was easier to produce papers from other disciplines (21.74% - not labelled). In responding to the survey question, 15.22% respondents felt that producing research papers in areas other than engineering would be better as engineering research was deemed complex and not easy to publish in. On the other hand, some felt that a lack of training awareness was contributing heavily in hindering their contributing in the research arena.

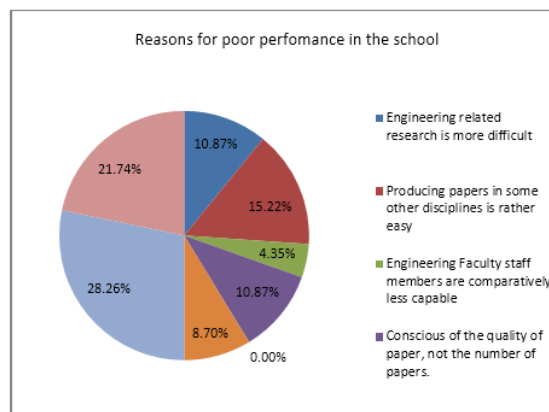


Figure 1: Reasons for poor publication in the School of Engineering.

Reasons for Not Publishing or Presenting Papers

This question was formulated to gain knowledge on the reasons for not publishing journal or conference papers. As shown in Figure 2, 28.21% of the participants have suggested that they do not publish journal or conference papers because they are dealing with a large number students in their modules. This could be attributed to the fact that there are more students that one is responsible for, meaning that more time is needed to concentrate on assisting them. This is shown to be the highest-rated reason why participants do not have time to publish their work or to engage in any research activities within or outside the university. Following this, the second reason why staff members do not publish their research work is due to the lack of a research culture and environment. This reason accounts for 23.08% of the participants.

Another reason for not publishing the research work is due to the poor quality of the students in the pipeline. The poor quality of the students consumes time for a staff member to explain further certain concepts of the module. This reasons accounts for only 10.26%. This proportion of the participants also cited that they do not publish their work due other reasons (10.26%). 17.95% of the participants have identified that they do not publish their research work due to the

continuous assessment in marking - lack of time (not labelled). In this category, participants have indicated that they do not have time to do research because they are expected to provide timely quality feedback to the students. This practice is regarded as the best in teaching engineering in general.

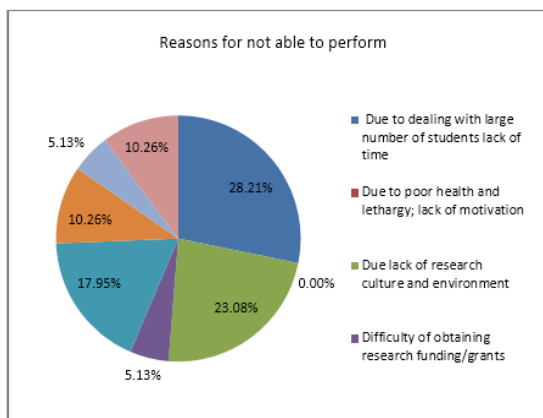


Figure 2: Reasons for not publishing or presenting papers.

Year of Paper Presentation or Publication by the Staff Members

The survey was conducted for the years 2011 to 2014. Through the questionnaire, it was seen that the majority of the respondents indicated that they published the majority of their papers in the year 2013. As shown in Figure 3, in 2013, only 29.17% of the participants published either a research paper or conference papers. 16.67% of the research or conference papers were published in 2014. The decline in the number of publications in the year 2014 was due to the fact that the questionnaire was completed in June 2014. This means that the research papers, which were published after July 2014, were not accounted for in this study.

When looking at the questionnaire, 33.33% of the respondents indicated that they had never published a paper in either a research journal or in conference proceedings. This could be attributed to the fact that approximately 28% indicated that they had to spend more time to evaluate students' work and had little time for research, if they were interested.

Even though this study was only targeted to include data from 2011 to 2014, 8.33% of the participants indicated that they had published papers only in 2008. Publications which were published in 2012 only accounted for 8.33%. 4.17% of papers were published in 2011, the worst year for publication. This results could be attributed to the number of new entrants in the teaching field. The majority of the staff members who participated in the survey had three years or less at the institution.

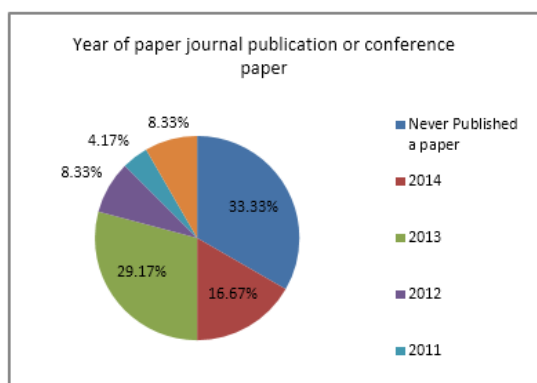


Figure 3: Year of paper publication by the staff members.

Number of Staff Members Satisfied and Number of Staff Who Have External Research Grant

The question was posed whether the staff members were happy with their research output. In answering this question, it was found that nearly 80% of the respondents were not happy with their research output and would like a push in the right direction, so that could begin producing outputs required for an academician. On the other side, only 20% seemed to be happy with what they had produced. This is a low percentage and more serious intervention needs to take place. In addition, 62.5% do not have internal or external research grants. This shows that the majority of the participants are not at a stage at which they can apply for external or internal grants. Research grants are seen as a vital tool for enhancing the researcher in terms of attending conferences or acquiring research tools relevant to the study. On the other hand, only 37.25% have managed to apply and be granted research funds in the period between the year

2011 and 2014. Even though this is good, more staff need to be pushed or motivated, so that they can reach a point at they can apply for their own research grants so that they could begin to publish their work.

DISCUSSION

Research outputs are of immense importance in academia, not only as a way of improving one's academic standing, but also as a way of enriching one's teaching and community engagement. As a result, there is great interest in finding out how engineering departments are faring in terms of research. In this sense, it is interesting to know that other researchers are interested in the same area. Other research has been conducted to compare research outputs from faculties/schools/colleges of engineering against those from other disciplines. Much of the comparison, though, is based on conventional institutions of learning, the reason being that there are very few institutions that offer engineering through distance education. It would be interesting to look at the findings from these sets of institutions in trying to interrogate this question.

In a study undertaken to investigate whether institutions teaching engineering through ODL in Sri Lanka conducted less research, Weerasekera found that the outputs from distance learning institutions were considerably less when compared to other institutions [3]. The results from that study are similar to those from the current study, and for the purpose of comparison of the Sri Lanka experience and the South African situation, the questionnaire from that study had been adopted for this research. These results seem to tally with those from another study conducted on Southern Nigerian universities, which found that engineering departments fared less favourably compared to departments in science [4]. While the science faculties had a grand mean of 10.02 with the highest contribution per department standing at 15.2, the output for engineering was 7.58, with the highest contribution being 11.8. In a study to compute the input and output efficiency of teaching and research for the faculties of the Islamic Azad University of Zahedan Branch, it was found that faculty of engineering was inefficient (< 1) in both teaching and research, with the research efficiency being as low as 0.35 [5].

Reasons for Poor Publication Rates in the School of Engineering

As indicated earlier, 28,26% of participants cited that the major reason for poor performance of research output is that there is too much administrative work during the day. Research outputs and patents are used as an indicators for evaluating performance at universities across the world [6-8]. The question maybe asked, what factors determine the research output of the academic engineer in an ODL environment? Can the academics be measured the same way as the traditionally or conventional universities? Do these researchers have the same challenges? Are these researchers given the same conditions of work? In this study, it was apparent that there is lack of time to do any other work including research work, due to a heavy administrative work burden. In regard to other reasons for poor publication rates in the School of Engineering, other studies found similar explanations [9-11], while it is understood that it is increasingly important to use publications and citations to measure the research productivity. This article only looks at the reasons why the research output at an ODL institution is lower than the traditional universities.

As referred to by Braimoh and Lephotla, regardless of the *gleaming temperance of distance training*, it is routinely subjected to harsh criticism by other contact public universities who apparently consider this procedure of teaching and learning as substandard, with less research and knowledge advancement [12]. Then again, the tracer study led on graduates going out in the year 2010 from UNISA demonstrated that more than 80% of designing graduates have shown complete fulfilment of research facility experience and field introduction amid their building undergraduate programme at UNISA. Incomprehensibly, open and distance education, as indicated by Braimoh [13], has awesome potential in that it is utilised to accommodate more than what the formal framework can do. Subsequently, the advancement and sustainability of ODL universities are expanding.

It is normally said that foundations, particularly universities, which lead education through the ODL mode conduct less teaching-based research. This is contrasted with traditional universities, which have a closer and more personal association with undergraduate students. This allegation is regularly made about all science disciplines, yet particularly about engineering. As said before, the School of Engineering at UNISA is the only university in South Africa and on the African continent, which offers engineering qualifications via distance learning. UNISA offers diplomas and degrees in civil, chemical, mining, industrial, electrical and mechanical engineering through ODL.

Reasons for Not Publishing or Presenting Papers

In preparing research publications, one has the advantage of sharing and shaping the knowledge of others in the industry. This does not limit one to influencing the local community, but rather the whole international community as well [14]. This question was formulated to gain knowledge on the reasons for not publishing journal or conference papers. As indicated earlier, 28.21% of the participants have suggested that they do not publish journal or conference paper, because they are dealing with a large number students in their modules. This could be attributed to the fact that the more students one is responsible for, then, more time is needed to concentrate on assisting them. In general, it is understood that at the micro-level, universities are using research publications and citations to monitor the performance of their researchers for salary increase and promotions [15].

There should be enough motivation for many to embark on research activities. However, according to the current study, close to 33% have not even published a single paper. Assuming that these researchers are motivated by money and the social status of being a professor, there should be an underlying factor why a large proportion of the participants have not published a paper since the beginning of their career. As reported earlier, dealing with a large number of students is the main reason why participants do not have time to publish their work or to engage in any research activities within or outside the university. Following this, another reason why staff members do not publish their research work is due to lack of a research culture and environment. This reason accounts for 23.03% of the participants. The third reason for not publishing the research work is due to the poor quality of the students in the pipeline.

The poor quality of the students in the pipeline consumes time for a staff member to explain further certain concepts of the module. This reason accounts for only 10.26%. 17.95% of the participants have identified that they do not publish their research work to the continuous assessment in marking - lack of time. Even though, some participants indicated that they did not publish due to lack of time, it was found that the most pressurised staff are the one who conduct high research activity. In this category, the participants indicated that they did not have time to do research, because they were expected to provide quality feedback to students in time. This practice is regarded as the best in teaching engineering in general [16][17].

Year of Paper Presentation or Publication by the Staff Members

Through the questionnaire, it was seen that out of those respondents who ever published, they published the majority of their papers in the year 2013. In that year 2013, 29.1% of the participants published either research papers or conference papers. 16.63% of the research or conference papers were published in 2014. The decline of publications in 2014 was due to the fact that the questionnaire was completed in June 2014; and the declined number of research output could have been due to several factors including the poor manuscripts submitted for publication in journals and conferences. The study of why outputs decreased in developing countries was developed by Singh [18].

When looking at the questionnaire, 33.33% of the respondents indicated that they had never published a single research paper in journals or conference proceedings. It is critical to note that the third of the respondents indicated that they never published any research paper since the beginning of their career. This could be attributed to various factors including that they did not have sufficient skills to perform research activities, they did not have the drive and passion to perform this task. This could be attributed to the fact that approximately 28% indicated that they needed more time to evaluate students' work and had little time for research, even if they were interested. This could be so due to the number of new entrants in the teaching field. The majority of the staff members who participated in the survey had three years or less in the institution.

Number of Staff Members' Satisfied and Number of Staff Who Have External Research Grant

The question was posed whether the staff members were happy with their research output. In answering this question, it was found that nearly 80% of the respondents were not happy with their research output and would like a push in the right direction, so that they could begin producing outputs required for an academic. The high percentage of the respondents who were not happy with their research output or performance shows that the respondents were willing to do something about their output. If given support, most of these respondents would be able to increase or begin their research production. On the other side, only 20% seemed to be happy with what they produced. This is a low percentage and more serious intervention needs to take place. Various strategies could be employed to motivate the few percentage that were happy with their production. In addition, only 62.5% did not have internal or external research grant. This shows that the majority of the participants are not at a stage where they can apply for an external or internal grant.

A research grant in research is seen as a vital tool to enhance the researcher in terms of attending conferences or acquiring research tools relevant to his/her study. On the other side, only 37.25% managed to somehow apply and be granted research funds in the duration between the year 2011 and 2014. Even though this is good, more staff need to be pushed or motivated, so that they can reach a point where they can apply for their own research grant and begin to publish their work. In conclusion, this study showed that there was a low research output by the respondents working in the School of Engineering. The main reason for not publishing research articles in journals or conference proceedings is because there is too much administrative work for staff members.

CONCLUSIONS

Research outputs are of immense importance in academia, not only as a way of improving one's academic standing, but also as a way of enriching one's teaching and community engagement. As a result, there is great interest in finding out how engineering departments are faring in terms of research. Also, it is critical to know other researchers with the same interest in the same area.

Much of the comparison, though, is based on conventional institutions of learning, the reason being that there are few institutions that offer engineering through distance education. In the South African context, the research output in the School of Engineering is relatively low compared to other schools or colleges due to the administrative work load.

It was found that nearly 80% of the respondents were not happy with their research output and would like to be led in the right direction, so that they could begin producing outputs required for an academic.

REFERENCES

1. Mabizela, M.C., The evolution of private provision of higher education in South Africa: The private higher education landscape: developing conceptual and empirical analysis. *Perspectives in Education: a Contested Good? Understanding private higher education in South Africa: Special Issue*, 4, **20**, 41-51 (2002).
2. Boucher, M., *Spes in arduis: A history of the University of South Africa*. University of South Africa (1973).
3. Weerasekera, K.S., Is it true that institutions involved in teaching engineering through ODL conduct less research? If so, why is it? Sri Lankan Experience (2011).
4. Okafor, V.N. and Dike, V.W., Research output of academics in the science and engineering faculties of federal universities in Southern Nigeria. *African J. of Library, Archives and Infor. Science*, 20, **1** (2008).
5. Payan, A., Performance Evaluation of Faculties of Islamic Azad University of Zahedan Branch Based-On Two-Component DEA (2008).
6. Narin, F., Patents as indicators for the evaluation of industrial research output. *Scientometrics*, 34, **3**, 489-496 (1995).
7. Pavitt, K., Do patents reflect the useful research output of universities? *Research Evaluation*, 7, **2**, 105-111 (1998).
8. Fox, K.J. and Milbourne, R., What determines research output of academic economists? *Economic Record*, 75, **3**, 256-267 (1999).
9. Laidlaw, B. and Layard, R., Traditional versus open university teaching methods: a cost comparison. *Higher Educ.*, 3, **4**, 439-468 (1974).
10. Berge, Z.L. and Mrozowski, S., Review of research in distance education, 1990 to 1999. *American J. of Distance Educ.*, 15, **3**, 5-19 (2001).
11. Goldfarb, B., The effect of government contracting on academic research: does the source of funding affect scientific output? *Research Policy*, 37, **1**, 41-58 (2008).
12. Braimoh, D. and Lephota, H.M., Democratizing education for the professional development of change agents through distance education process: the case of Lesotho. *Indian J. of Open Learning*, 9, **2**, 131-146 (2010).
13. Braimoh, D., *Assuring Quality through Institutional Collaboration on Study Materials Development for Distance Learners*. In: Dikshit, H.P., Garg, S., Panda, S. and Vijayshri (Eds), *Access and Equity: Challenges for Open and Distance Learning*. New Delhi: Kodan Page India, 243-251 (2002).
14. Arundel, A. and Geuna, A., Does Proximity Matter for Knowledge Transfer from Public Institutes and Universities to Firms? SPRU-Science and Technology Policy Research, University of Sussex (2001).
15. Gonzalez-Brambila, C. and Veloso, F.M., The determinants of research output and impact: a study of Mexican researchers. *Research Policy*, 36, 7, 1035-1051 (2007).
16. Geuna, A., Allocation of funds and research output: the case of UK universities. *Revue d'Économie Industrielle*, 79, **1**, 143-162 (1997).
17. Braun, T. and Schubert, A.S., Indicators of research output in the sciences from 5 Central European countries, 1990-1994. *Scientometrics*, 36, **2**, 145-165 (1996).
18. Singh, D., Publication bias-a reason for the decreased research output in developing countries. *African J. of Psychiatry*, 9, **3**, 153-155 (2006).

BIOGRAPHY



Fulufhelo N̄emavhola is a senior lecturer in the Department of Mechanical and Industrial Engineering at the University of South Africa, Florida, South Africa. He graduated with a Bachelor of Science in mechanical engineering and a Master of Science in engineering from the University of the Witwatersrand, Johannesburg, South Africa. He completed his PhD in computational biomechanics at the University of Cape Town, South Africa. His research is mainly in the area of soft tissue mechanics, but he has special interest in engineering education through open distance learning. Fulufhelo is a registered professional engineer with the Engineering Council of South Africa. Furthermore, he is also registered as a Chartered Engineer with the Engineering Council of the United Kingdom.