

“Research output level at Durban University of Technology (DUT) in South Africa: contributing factors and their implications”

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Research output level at Durban University of Technology (DUT) in South Africa: contributing factors and their implications

Abstract

Various factors contributing to the level of research output at the Durban of University of Technology (DUT) are investigated by this research and their implications to the University are also examined. Data are collected from six faculties at DUT. A stratified sample of 60 respondents is used, with the sample consisting of 30 experienced researchers and 30 emerging researchers, selected from the academic staff. Respondents are asked to complete a 5-point Likert scale questionnaire, with the help of an interviewer. Space is provided for each of the questions in the questionnaire, to allow respondents to provide additional, relevant information, which might left out during the formulation of the questionnaire. A mixed approach of both qualitative and quantitative techniques is used, while the analysis of primary data is done using SPSS, version 21.0. Results of the study reveal that the majority of respondents indicates various factors, including individual and institutional elements, as the main barrier to participate in doing research. This paper will benefit University management, academic staff, potential university academic staff, the university's human resource department, other South African universities, the South African Department of Higher Education, the South African Council of High Education and South African education policy makers. The findings are limited by the study's exploratory nature and only one university is considered. Generalization of this study should be done with care, while it is recommended that further research, with a large sample, should concentrate on the development of an academic workload allocation policy at the Universities and effective implementation of the policy encouraged.

Keywords: contributing, output, level, factors, research, DUT, implications, South Africa.

JEL Classification: M21.

Introduction

Since the 1994 elections, the new government instituted reforms designed to give South Africa a unified and coherent educational system with which to redress the inequities of the previous regime. In 1997, the country adopted the Higher Education Act, which instituted a series of fundamental educational reforms. Between 2004 and 2009, the Department of Education (DoE) was transformed and renamed the Department of Higher Education and Training (DHET). In 2009 DHET emphasized the need for Higher Education Institutions (HEIs) to embrace research as a base to their teaching and learning aspects. These changes, in the higher education system in South Africa, resulted in the merger of ML Sultan Technikon and Technikon Natal to become DUT, which has resulted in a number of challenges in terms of their research activities, as these institutions did not have a prior, established research culture. The South African DHET measures University research output by the number of peer-reviewed journal articles, conference proceedings and scholarly books and book chapters published annually. The DHET also sets targets for each institutional category in which universities should achieve, in respect of research output. Based on the DUT research office records the institution has produced less than 0.20 units of research output over the past 10 years. This fell short of the DHET benchmark of 0.565 per academic staff member

(DHET, 2003-2011). The study found that this underperformance in research publications is influenced by a number of factors, including Institutional, personal, financial, infrastructural, scholarly and professional factors. Results were based on the total of 577 DUT academic staff, from which the sample size of 60 respondents were drawn from. The study's aim was to investigate the problem and recommend various means of improvement, with regard to output of research publications in the University.

1. Problem statement

The DUT has been unable to meet the DHET's expected research output target (DHET, 2003-2011). In an effort to improve research capacity, DUT continues to be challenged to reach the requisite minimum level of 0.565 research units per academic staff member per year, as set out by DHET Report (2011).

2. Aims and objectives

2.1. Aims. The main aim was to establish those factors that contribute to the research output level at DUT, and examine their implications on the research output.

2.2. Objectives. To achieve the overall aim of the study, the following objectives were fulfilled:

- ◆ To identify various factors contributing to the research output level at DUT and;
- ◆ To examine the implications these factors have on the research output level at DUT.

3. Literature review

This section will discuss the critical factors affecting the level of research output at the DUT.

3.1. Institutional culture. The DUT only became a university, i.e. University of Technology (UoT), in 2009, emerging from a merger process that began in 2002/2003 (DUT annual report, 2009, p. 4). During the period of 2000-2008, DUT was predominantly an undergraduate qualifications institution (Bunting, Sheppard, Cloete and Belding, 2010). However, DUT's proportion of research staff with doctorates was below the national average throughout that period. According to Chetty (2003), Technikons had witnessed a dramatic change in their scholarly ethos, with many of the previously disadvantaged Technikons failing to move beyond their primary mission of teaching and shift towards scholarly productivity, with an emphasis on research and publications. A strong research culture at an institution, and within its departments, encourages quality research. Such a research culture is formed by practices that include recognition and reward for quality research, the identification models of good research processes and administrative support (Schulze, 2008, p. 651).

3.2. Infrastructure and financial challenges. Higher Education in the Southern African region has suffered from historical underfunding, structural adjustment policies and the influence of international agencies that favored an emphasis on primary education during the 1980s and 1990s (SARUA, 2009, p. 17). Although the policies have been reviewed in the past decade, it is still evident that the higher education system faces the challenge of being seriously under-resourced and therefore unable to fulfill the new expectations. Some of the South African institutions of higher learning have relied on donor funding to undertake the initiatives required to address challenges in the universities; however, it is not possible to sustain such programs through donor funding (Higher Education South Africa (HESA), 2011). Access to suitable infrastructure is a constraint in carrying out research activities; for many South African universities the availability and quality of research facilities and equipment is a challenge. The HESA report indicates that this is not a constraint only for UoTs, as this is also a challenge at 12 of the 23 universities that produce 95 percent of doctoral graduates.

3.3. Staff development programs. The emphasis should be on staff development as an important element of an institutional research development strategy. The report also maintains that there is a correlation between the number of academics with

PhD qualifications and the number of research publication output units that accrue to institutions. It is therefore apparent that the managers of universities need to find a sustainable approach in ensuring the university increases its total research output (DHET Report, 2009). In Australia, it has been noticed that the managers of universities can no longer simply hope that researcher development will occur by osmosis, meaning that planned and sustained interventions are needed to redress any fundamental deficiencies in research knowledge and skills, to ultimately build confidence to research and publish from that work (Debowski, 2006 as cited by Hemmings and Kay, 2010).

Previous researchers stress that mentorship can be considered as a possible vehicle for promoting research capacity among academics and that it is a widely favored capacity building strategy by academics (Nundullal and Dorasamy, 2012). Unfortunately, it is challenging to develop formal mentoring relationships with early career academics because of time constraints and the need to create opportunities for collegial interactions and friendships (Clarke, 2004, as cited by Hemmings and Kay, 2010). This is also supported by Nundullal and Reddy (2011) who state that, for capacity building strategies to be successful, they must have the active involvement of all the relevant parties concerned, such as line managers, the human resource department and support from top management. However, a DHET report (2003-2011) indicates that DUT's research output has been growing steadily from 26.36 units in 2003 to 88.88 units in 2011; nonetheless, even with the recent growth the DHET benchmark has not yet been met. In order to put researcher development programs forward that cater for the needs of academics, it is important to know what the factors are that hinder academic staff's research performance.

3.4. Academic management. Good management is vital to any organization that seeks to excel and achieve its goals. Some of the challenges identified by Chetty (2003) are that of poor academic management, institutional management lacking effectiveness, participatory and transparency in their management style leading to endemic financial crises, high management turnover, poor research output and low quality graduates. HESA (2011) maintains that excelling in and managing the teaching, research and community engagement functions of the university, and academic life and institutional transformation challenges require knowledge, specialist expertise and experience on the part of the academic. Jansen (2002) (as cited in Chetty, 2003) indicates that most senior academics

(deans, heads of department and management) are poor researchers themselves, they cannot therefore demand any excellence or research output from their staff in their faculties, as they do not lend any credibility. It is important for a manager to lead by example and it is one of the attributes of a leader.

In order to assist academics to acquire the requisite knowledge and expertise, capacity development strategies must be put in place by the institutions to enhance and support the research capacity of academics. Karimian et al. (2011) point out that the internal obstacles to research, as considered by academics, and the effect of these obstacles on academics' research activity must be identified.

Chetty (2003) states that previously disadvantaged Technikons need to rethink their commitment to research development by urgently addressing the lack of basic physical resources, the need to break the silence on issues such as the dichotomy between the scholarships of teaching and research, inappropriate schedules for lectures and the consequent poor performance in research audits.

3.5. Performance management in higher education institutions. Performance that is measured can be enhanced, maintained and evaluated; however, some authors are of the view that performance management practices in HEIs cannot be implemented in the same way as in the business environment.

Walwyn (2008) states that performance management of HEIs is a major challenge for many countries and that, while performance management practices and the use of performance indicators have been commonplace within business enterprises for many decades; their application to HEIs by their line departments has been a relatively recent phenomenon. Mbali (2006) finds that the last decade in South Africa has seen an increase in State steering of higher education and that another trend has recently also become apparent, which is to adopt procedures from the corporate world.

The treatment of all institutions according to a common set of expectations and benchmarks is, according to Walwyn (2008), an approach which is seen as ignoring the separate historical roles of UoT versus traditional universities. While a UoT tends to produce a different profile of output, with more emphasis on design, technology packages or demonstrators and patents, traditional universities are more focused on high quality publications and research qualifications. This view is supported by Mbali (2006) when stipulating the different goals of different disciplines within universities and states that greater clarity regarding the goals of the universities and the goals of universities of tech-

nology should result, in some respects, in conceptualizing different types of funding incentives and quality controls for each. Mbali (2006) argues that the different goals of different disciplines within universities have been determined using the measures that arose in the generic and foundational disciplines, such as that of a PhD, and the production of peer reviewed research articles have come to be applied to all disciplines, whether appropriately or not. According to Mbali (2006), the word "performance" is applied to precise, measurable, economic and financial output and therefore cautions that there are risks in uncritical transference of this word to public higher education institutions. The study further points out the conceptual issues in imposing performance management in HE, as output in this sphere is less easy to quantify, more complex than that of a factory or assembly line supervisor and is at a more philosophical level.

Additional changes to the performance management framework are recommended by Walwyn (2008), such as: (a) The scope of allowable research output is expanded to include patents, designs, and technology packages; (b) Weighting of research articles, as measured using DHET guidelines, should be adjusted for quality of each article using a normalized citation frequency or an impact factor approach.

Walwyn (2008) argues that the funding framework of South African HEIs is complex and flawed, in that it does not conform to certain key principles of a performance management system, and as a result requires revision. The framework reinforces behaviors that will not serve the longer term needs of the country, in respect of higher education and knowledge generation, a view which is supported by Mbali (2006).

3.6. The role of the research office. According to Raftery and Nasinyama (2010) research management involves the provision of professional expert advice, coupled with internal structures and processes, to maximize the quality and impact of research and that the Research Office is at the core of research management. The authors further indicate that the Research Office is an integral component of the governance structure of a modern, research-active Higher Education Institution and that it should offer institution-wide expertise to individual academics, to support research excellence and research output of socioeconomic relevance.

Schulze (2008) that differentiated support for differing needs of academic staff members is necessary for functional fit and efficacy. Hazelkorn (2004) maintains that the Research Office has now virtually become ubiquitous within all institutions

who are seeking to grow research; it is considered the key structural and organizational ingredient to activate and support research activity. The services of the Research Office are elaborated on by Raftery and Nasinyama (2010), such as *inter alia*: project preparation, proposal writing, financial or budget advice, project management, funding sources, research contract negotiations, external review of research concentrations, supervisor registration and training and audit of publications and research income, as well as strategic and policy framework.

In terms of staff development, the Research Office is expected to drive capacity building initiatives, in order to increase a pool of researchers. At DUT, the Research Office is charged with ensuring that young, black and female researchers are groomed, so as to grow the number of publications from these groups, while facilitating their participation in research activities (DUT Annual report, 2009).

3.7. Research methodology. In this study, questionnaires were administered via email to individuals ensuring that no one was able to see who had been approached. A cover letter was part of the email and participants were provided with a deadline by which to respond. Participants were informed to return the questionnaires by email to the researcher once completed. A ten day timeframe was set, within which to return the completed questionnaires. The response rate was low, with almost half the responses received and no other responses forthcoming as at 06 June 2013. A reminder was then sent out on 06 June 2013, with a deadline date of three days, resulting in another 15 responses being received.

Respondents were asked to choose one statement stating factors affecting her/him. Summary of the key questions included in the questionnaire are discussed in Table 1.

Table 1. Summary of key questions

Statement	Questions
Financial factors	Response alternatives: ◆ Insufficient budget for research activities; ◆ Criteria for allocation of budget; ◆ Lower funding for research activities compared to other activities; ◆ Heavy dependence on the institution's funding; ◆ Inability to secure external funding to support my research; ◆ Any other (specify):
Infrastructural factors	Response alternatives: ◆ Lack of knowledgeable research support staff; ◆ Lack of skilled and efficient co-researchers; ◆ Lack of active research niche areas in the institution; ◆ Lack of research materials (equipment, software); ◆ Insufficient access to scholarly references; (Libraries, scholarly database subscriptions) ◆ Any other (specify):
Professional factors	Response alternatives: ◆ Heavy load of executive /managerial/administrative work and inadequate time for research; ◆ Lack of networks with other research universities/research councils; ◆ Difficulty in participating in professional development opportunities (attending seminars & conferences) ◆ Any other (specify):
Scholarly factors	Response alternatives: ◆ Lack of sufficient knowledge of research theories and practices (e.g. statistical tests, questionnaire preparations); ◆ Lack of research writing skills; ◆ Inadequate skills in computer software and hardware; ◆ Inadequate skills to identify, analyze and process research problems; ◆ Lack of knowledge in where to search for national and international articles and using e-journals; ◆ Any other (specify):
Personal factors	Response alternatives: ◆ Lack of motivation for research; ◆ Self-centered attitude and lack of participation in group activities; ◆ Personal and family circumstances; ◆ Lack of financial incentives from research; ◆ Any other (specify):
Institutional factors	Response alternatives: ◆ Logistics in the process of the evaluation of research proposals; ◆ Allocation of research budget to problems that have trivial impact on society; ◆ Repetition of similar research at the university; ◆ Experience of reviewers and policy makers who review research proposals ◆ Any other (specify):

3.8. Data collection. The questionnaire was used to collect primary data for the study. It was a

personally administered questionnaire via emails. A total of 60 questionnaires were distributed in all six

faculties at the DUT. Instructions were given in each questionnaire to maintain consistent feedback from respondents and a timeframe of ten days was given within which to respond.

3.9. Data analysis. Questionnaires were pre-coded and captured in the SPSS (version 21.0) program. Data were analyzed for frequencies tables, descriptive analysis, cross tabulations, correlations and also chi-square tests to measure relationships of variables.

3.10. Reliability and validity. In order to test reliability and validity of this study, Cronbach's Alpha was used to test at a 0.75 significant level. There results were found to be scientifically correct $X^2 = 1.046$; $df = 1$; $P = 0.7$

3.11. Research findings. Findings of this study, based on the response from the respondents, with regard to the following variables, are discussed in Table 2.

Table 2. Factors that hinder and stifle research output for male and female researchers at DUT

Category	Male academics	Female academics
Financial factors	1. Insufficient budget for research activities 2. Heavy dependence on the institution's funding	1. Insufficient budget for research activities 2. All remaining factors scored equally
Infrastructural factors	1. Lack of active research niche areas 2. Lack of knowledgeable support staff, lack of skilled and efficient co-researchers	1. Lack of active research niche areas 2. Lack of knowledgeable support staff, lack of skilled and efficient co-researchers
Professional factors	1. Heavy load of executive/managerial/administrative work and inadequate time for research 2. Lack of networks with other research universities/ research councils 3. Difficulty participating in professional development	1. Heavy load of executive/managerial/administrative work and inadequate time for research 2. Lack of networks with other research universities/ research councils
Scholarly factors	1. Inadequate skills in computer software and hardware 2. Lack of sufficient knowledge of research theories and practices	1. Lack of sufficient knowledge of research theories and practices 2. Inadequate skills in computer software and hardware
Personal factors	1. Lack of financial incentives for research 2. Personal and family circumstances	1. Lack of financial incentives for research 2. Personal and family circumstances 3. Self-centered attitude and lack of participation in group activities
Institutional factors	1. Experience of reviewers and policy makers who review research proposals 2. Logistics in the process of evaluation of research proposals	1. Logistics in the process of evaluation of research proposals 2. Allocation of budget to problems of trivial impact on society

Table 3. Financial factors

Statement	Emerging researchers		Experienced researchers		Overall	
	No.	%	No.	%	No.	%
Insufficient budget for research activities	5	23.8%	8	34.8%	13	29.5%
Criteria for allocation of budget	2	9.5%	2	8.7%	4	9.1%
Lower funding for research activities compared to other activities	2	9.5%	1	4.3%	3	6.8%
Heavy dependence on the institution's funding	3	14.3%	3	13%	6	13.6%
Inability to secure external funding to support my research	2	9.5%	2	8.7%	4	9.1%
Any other (specify):	1	4.8%	4	17%	5	11.4%
Invalid responses	6	28.6%	3	13%	9	20.5%
Total responses	21	100%	23	100	44	100%

Emerging and experienced researchers rated insufficient budget for research activities at 23.8 percent and 34.8 percent respectively, as the biggest obstacle of the financial factors, in enhancing their research output. This was followed by heavy dependence on the institution's funding at 14.3 percent for emerging researchers, while for established researchers the second factor was the same at 13 percent. There is an indication from both emerging and experienced researchers that the budget allocated for research activities at the DUT is extremely inadequate. This also attests to the challenge of inadequate funding of HEIs affecting all institutions. Researchers are mostly dependent on

the institution's funding, as they are unable to secure external funding. This may be as a result of not being capacitated to or not receiving enough support to apply and put together professionally competitive research proposals, in order to secure external funding. Overall, the top two obstacles of the financial factors, to enhancing research output, were insufficient budget for research activities and heavy dependence on institution's funding at 29.5 percent and 13.6 percent, respectively.

A Chi-square goodness of fit test showed this finding to be statistically significant ($X^2 = 6.037$; $df = 1$; $P = 0.014$).

Table 4. Infrastructural factors

Statement	Emerging researchers		Experienced researchers		Overall	
	No.	%	No.	%	No.	%
Lack of knowledgeable research support staff	4	19.0%	4	17.4%	8	18.2%
Lack of skilled and efficient co-researchers	1	4.8%	7	30.4%	8	18.2%
Lack of active research niche areas in the institution	8	38.1%	6	26.1%	14	31.8%
Lack of research materials (equipment, software)	2	9.5%	2	8.7	4	9.1%
Insufficient access to scholarly references (Libraries, scholarly database subscriptions)	0	0%	0	0%	0	0
Any other (specify):	2	9.5%	1	4.3%	3	6.8%
Invalid response	4	19.0%	3	13%	7	15.9%
Total	21	100%	23	100%	44	100%

Emerging researchers rated a lack of active research niche areas in the institution as an obstacle in the infrastructural factors, that hinders their research output at 38.1 percent and experienced researchers rated the same factor at 31.8 percent. A second factor, rated at 19.0 percent by emerging researches, was a lack of knowledgeable research support staff, while experienced researchers equally rated a lack of knowledgeable research support staff, and a lack of skilled and efficient co-researchers, at 18.2 percent.

Overall, the top two obstacles to enhancing research output of the infrastructural factors were a lack of active research niche areas in the institution at 31.8 percent and at 18.2 percent, both a lack of knowledgeable research support staff and a lack of skilled and efficient co-researchers, were rated equally.

A Chi-square goodness of fit test showed this finding to be statistically significant ($\chi^2 = 7.397$; $df = 1$; $P = 0.007$).

Table 5. Professional factors

Statement	Emerging researchers		Experienced researchers		Overall	
	No.	%	No.	%	No.	%
Heavy load of executive/managerial/administrative work and inadequate time for research	15	71.4%	19	82.6%	34	77.3%
Lack of networks with other research universities/research councils	3	14.3%	0	0%	3	6.8%
Difficulty in participating in professional development opportunities (attending seminars & conferences)	0	0%	1	4.3%	1	2.3%
Any other (specify):	1	4.8%	2	8.7%	3	6.8%
Invalid response	2	9.5%	1	4.3%	3	6.8%
Total	21	100%	23	100%	44	100%

The top professional factor, rated by both emerging and experienced researchers, respectively at 71.4 percent and 82.6 percent, was the heavy load of executive, managerial, and administrative work, as well as inadequate time for research. The second factor, rated at 14.3 percent by emerging researchers, was a lack of networks with other research universities/research councils, while experienced researchers rated the difficulty in participating in professional development opportunities, as their second highest obstacle to enhancing their research

output, at 4.3 percent. Overall, the top two noted obstacles to enhancing research output, with regard to professional factors, were the heavy load of executive/managerial/administrative work and inadequate time for research and the lack of networks with other research universities/research councils, at 15.9 percent and 18.2 percent, respectively

A Chi-square goodness of fit test showed this finding to be statistically significant ($\chi^2 = 82.775$; $df = 24$; $P = .000$).

Table 6. Scholarly factors

Statement	Emerging researchers		Experienced researchers		Overall	
	No.	%	No.	%	No.	%
Lack of sufficient knowledge of research theories and practices (e.g. statistical tests, questionnaire preparations)	2	9.5%	5	21.7%	7	15.9%
Lack of research writing skills	3	14.3%	2	8.7%	5	11.4%
Inadequate skills in computer software and hardware	5	23.8%	3	13%	8	18.2%
Inadequate skills to identify, analyze and process research problems	0	0%	0	0%	0	0%
Lack of knowledge in where to search for national and international articles and using e-journals	1	4.8%	0	0%	1	2.3%
Any other(specify):	2	9.5%	1	4.3%	3	6.8%

Table 6 (cont.). Scholarly factors

Statement	Emerging researchers		Experienced researchers		Overall	
	No.	%	No.	%	No.	%
Invalid response	8	38.1%	12	52.2%	20	45.5%
Total	21	100%	23	100%	44	100%

Emerging researchers rated a lack of research writing skills as the top obstacle of the scholarly factors, to enhancing research output, while experienced researchers rated a lack of sufficient knowledge of research theories and practices as the most important obstacle of the scholarly factors, to enhancing research output. Both emerging and experienced researchers rated the inadequate skills in computer software and hardware as the second highest obstacle of the scholarly factors, to enhan-

cing research output, at 23.8 percent and 13 percent, respectively. Overall, the two top obstacles, to enhancing research output, as far as scholarly factors are concerned, were inadequate skills in computer software and hardware, rated at 18.2 percent, and a lack of sufficient knowledge of research theories and practices, at 15.9 percent. A Chi-square goodness of fit test showed this finding to be statistically significant ($X^2 = 6.272$; $df = 1$; $P = 0.012$).

Table 7. Personal factors

Statement	Emerging researchers		Experienced researchers		Overall	
	No.	%	No.	%	No.	%
Lack of motivation for research	1	4.8%	0	0%	1	2.3%
Self-centered attitude and lack of participation in group activities	2	9.5%	2	8.7%	4	9.1%
Personal and family circumstances	3	14.3%	5	21.7%	8	18.2%
Lack of financial incentives from research	5	23.8%	9	39.1%	14	31.86%
Any other (specify):	2	9.5%	2	8.7%	4	9.1%
Invalid response	8	38.1%	5	21.7%	13	29.5%
Total	21	100%	23	100%	44	100%

Both emerging and experienced researchers rated a lack of financial incentives from research as one of the main obstacles to enhancing research output at 23.8 percent and 39.1 percent, respectively, regarding personal factors. Once again, both emerging and experienced researchers rated personal and family circumstance as the second most important obstacle in respect of personal factors, at 14.3 percent and 21.7 percent, respectively. Overall, the top obstacles,

noted by both emerging and experienced researchers, were a lack of financial incentives from research and personal and family circumstances, rated at 31.86 percent and 18.2 percent, respectively for personal factors.

A Chi-square goodness of fit test showed this finding to be statistically significant ($X^2 = 6.438$; $df = 1$; $P = 0.011$).

Table 8. Institutional factors

Statement	Emerging researchers		Experienced researchers		Overall	
	No.	%	No.	%	No.	%
Logistics in the process of the evaluation of research proposals	4	19.0%	5	21.7%	9	20.1%
Allocation of research budget to problems that have trivial impact on society	3	14.3%	2	8.7%	5	11.4%
Repetition of similar research at the university	0	0%	1	4.3%	1	2.3%
Experience of reviewers and policy makers who review research proposals	2	9.5%	5	21.7%	7	15.9%
Any other (specify):	3	14.3%	4	17.4%	7	15.9%
Invalid response	9	42.9%	6	30%	15	34.1%
Total	21	100%	23	100%	44	100%

A total of 19.0 percent of emerging researchers rated logistics in the process of the evaluation of research proposals, as the top obstacle to enhancing research output, where institutional factors are concerned. Experienced researchers rated logistics in the process of the evaluation of research proposals and the experience of reviewers and

policy makers who review research proposals, as their top obstacle to enhancing research output, at 21.7 percent. Both emerging and experienced researchers rated the allocation of research budget to problems that have a trivial impact on society as the second obstacle, at 14.3 percent and 8.7 percent, respectively. Overall, the logistics in the process of

the evaluation of research proposals and the experience of reviewers and policy makers who review research proposals, were noted as the top two obstacles hindering research output, at 20.1 percent and 15.9 percent respectively, for institutional factors.

A Chi-square goodness of fit test showed this finding to be statistically significant ($X^2 = 5.600$; $df = 1$; $P = 0.018$).

3.12. Limitations. The study was conducted at DUT without inclusion of either other universities of technology or comprehensive universities. Therefore, the sample size was too small, which limits the generalization of the findings.

3.13. Implications for research theory. In order to make improvements on research output, with specific reference to UoT, university management and all relevant stakeholders should have a clear understanding of the relevant theoretical frameworks that can be implemented to solve research challenges faced by university researchers. Updated research policies within universities should be encouraged and implemented. This means that the job allocation policy of the university needs to be implemented, as this will allow more academics to become more involved in research activities.

3.14. Implication for research practice. From a practical perspective, the results of this study clearly indicate that, due to the lack of financial support and time constraints, academic staff do not participate fully in research activities. The study found that there is no free time for academic staff to undertake research, as most of their time is allocated to teaching and learning activities. It has been noted that the academic job allocation policy of universities has to be either implemented or put in place, so as to allow more academics to become involved with research activities. Therefore, the practical implications of this study will benefit DUT and its stakeholders, by suggesting new ways of how to deal with the low level of research output within the university.

4. Recommendations

In order to enable universities to improve their level of research output, it is recommended that more needs to be done to promote a culture of research among the university staff in both non-academics and academics. Apart from many challenges in obtaining financial support, universities are also

faced with many academic staff that lack proper skills to undertake research and the consequent publication of their work. Therefore, the study recommends that universities should focus on training programs and workshops targeting potential researchers. Universities should reconsider/revise their incentive policy for researchers and minimize ethical clearance procedure for those who apply to do research. In addition, the empowerment of research support staff is recommended, to enable support staff to assist researchers in identifying external funding sources and making researchers aware of information regarding relevant research groups, tailored to save researchers' time. Furthermore, it is recommended that an academic workload allocation policy should be implemented.

Conclusions

University research in South Africa plays an essential role in the development and growth of South Africa's economy and has become the primary source of information for government sectors. These universities are faced with a variety of exogenous and endogenous variables, which not only affect their research output but their quality of teaching and learning strategies and outcomes as well. The aim of this study was to determine the causes and their implications on the research output levels of DUT. The research formulated two objectives to identify various factors that contribute to the research output level at DUT, and examined the implications these factors have on the research output level at DUT. The results reflected in the study indicate that insufficient budget for research activities, lack of knowledgeable research support staff, a heavy load of executive/managerial/administrative work and inadequate time for research, along with a lack of sufficient knowledge of research theories and practices, and a lack of financial incentives from research, as well as logistics in the process of the evaluation of research proposals, are the key factors affecting research output level at DUT. On the other hand, a lack of research writing skills, personal and family circumstances, inadequate skills in computer software and hardware, and a lack of active research niche areas in the institution, are the main personal factors limiting research activities at the university.

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