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RESEARCH TECHNOLOGY AS A BARRIER TO RESEARCH IN THE HUMAN SCIENCES

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OPSOMMING

Die vordering van magister en doktorale studente skyn aansienlike kommer te wek, en die oorsake daarvan word in die afwesigheid van 'n gepaste navorsingsklimaat op kampusse, gesoek. Die doel van hierdie studie was om faktore te identifiseer wat verband hou met die navorsingsuitset van dosente. Met die oog hierop is 'n vraelys opgestel en aan 120 dosente in die geesteswetenskappe vir voltooiing oorhandig. Die gemiddeldes en variansies van die veranderlikes is bereken, die veranderlikes is geïnterkorreleer en aan 'n hooffaktorontleding onderwerp. Vier faktore is onttrek en geïdentifiseer as: kennis van navorsingstegnologie, navorsingsuitset, kennis van navorsingsmetodologie en die vermoë om navorsing te doen, en onderrigervaring in navorsingsmetodologie. Twee regressie-ontledings is gedoen. Die eerste teen 'n "sagte" kriterium (persepsie van dosente van hul vermoë om empiriese navorsing te doen) en die tweede teen 'n "harde" kriterium (die werklike navorsingsuitset van dosente). Meervoudige korrelasies van 0,7257 en 0,5824, onderskeidelik, is verkry.

ABSTRACT

There appears to be considerable concern regarding the progress which masters and doctoral students make in their studies and the underlying causes are thought to relate to the absence of a suitable research climate on campuses. The aim of this study was to identify factors which relate to the research output of tutors. With this in mind a questionnaire was developed and handed to 120 tutors in the human sciences for completion. The means and variances of the variables in the questionnaire were computed, the variables were intercorrelated and subjected to a principal factor analysis. Four factors were extracted and identified as: knowledge of research technology, research output, knowledge of research methodology and ability to conduct research, and teaching experience in research methodology. Two regression analyses were done. The first against a "soft" criterion (perceived ability to conduct empirical research) and the second against a "hard" criterion (the real research output of tutors). Multiple correlation coefficients of 0,7257 and 0,5824 respectively, were obtained.

Smit and Tyson (1990) suggest that there is world wide concern about the long periods of time it takes students to complete their studies and, in particular, about the high percentage of masters and doctoral students who terminate their studies. In addition to the poor progression from honours to masters and doctoral studies they found, for example, that approximately half of the masters students and more than 60 percent of the doctoral students in South Africa terminate their studies. Concern about the poor state of affairs in the area of research is evident not only in the human sciences – for example, in social work (Lindsey & Kirk, 1992), but also in the natural sciences (Subotnik, Duschl & Selmon, 1993). Neither is the concern limited to particular types (basic or applied) of research (Lindsey et al.).

Although social and physical scientists "have rarely held identical views concerning the nature of the scientific process" (Goldenberg, 1982, p. 250), the human sciences in general and psychology in particular, through the development of a research methodology and research technology of their own, may be considered to comply to a large extent with the requirements of the "scientific method". The body of knowledge and research repertoire in the human sciences are such that scientists have been trained who measure high on each of Mitroff's (1974) dimensions: "abstract theoriser", "humanistic scientist", "rigorous experimentalist" and "intuitive synthesizer". These dimensions can be considered as qualities typifying the "true scientist"; qualities that imply on the part of the scientist the potential of self-renewal, and in terms of his or her science, the potential of growth and development.

Given the poor research achievement of post-graduate students on the one hand, and the availability of knowledge, method and technique on the other, the conclusions of Smit and Tyson (1990) seem to be intuitively acceptable. They attribute the poor achievement of post-graduate students to unqualified and inexperienced supervisors and promoters, inadequate training in research as well as a poor academic and research climate on campus. Lindsey and Kirk (1992) ascribe the "research crisis" to a lack of commitment. In turn Subotnik *et al.* (1993) showed that research mentors who do not provide general advice, do not suggest research topics, do not provide access to equipment nor to facilities and who do not encourage "introductions" to professionals in the field, contribute to their students "not staying in science".

The unfolding argument, particularly in the light of the Smit and Tyson conclusions, seems to implicate the mentor (supervisor or promoter). It is posited that two apparently independent, though intertwined, responses from mentors can be expected. The one being that not all psychological or social phenomena are amenable to the objectivity of observation implied by the "scientific method", but rather to "an accurate description of the *experiencing* of something or other" (a rather well known rationalisation). The other being that the imminent "paradigm shift" in the world of science needs to be taken into account. The latter response probably stems from physics where, as a consequence of quantum theory, the role

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of the observer (researcher) seems to influence the observed, thus bringing the feasibility of "objectivity" in the scientific method into question. Davies (1983, p. 103) puts it as follows: "(The atom) only materializes when you look for it. And you can decide what to look for. Look for its location and you get an atom at a place. Look for its motion and you get an atom with a speed. But you can't have both. The reality that the observation sharpens into focus cannot be separated from the observer and his choice of measurement strategy." In this paper the following positions are taken:

- some phenomena in the human sciences are not researchable (this position is akin to that of Parducci and Sarris (1984, p. 9) who suggested that: "Physicists do not try to predict the trajectories of leaves falling from trees")
- the recording of experiences of ordinary people and/or the wisdom of experts does not constitute a body of scientific knowledge
- the paradigm shift has not crystallised to the extent that an acceptable alternative for the scientific method can be agreed upon.

Given the above it is suggested that, presently, research mentors in the human sciences cannot escape adherence to the "scientific method". For the purposes of this paper, as has been hinted above, a distinction within the "scientific method" can made between research methodology and research technology. The former implying "experimental design" (the manner in which data are collected) and the latter implying "statistical analyses" (the manner in which data are analysed). It is furthermore suggested that, uneasiness regarding research technology underlies, as a primary factor, the research mentor's "inability" to stimulate either basic and/or applied research.

The objectives of this study were:

- to verify the findings of Smit and Tyson (1990) regarding poor research output, and
- to identify the factors which contribute to the reseach output of tutors in the human sciences.

METHOD

The Survey Questionnaire

A questionnaire which deals with various training and research issues in the human sciences was constructed and applied to a random sample of tutors (research mentors) in the human sciences at a South African university.

The Survey Questionnaire deals with the following issues: the *academic qualifications* of tutors concerned with post-graduate research training and supervision; the number of *journal articles* they have published in recognised scientific journals; the number of masters and doctoral students who have completed their studies under their supervision; the number of years that they have taught research methodology at pre-graduate level; the number of years that they have taught research methodology at post-graduate level; the number of years that they have been involved with the supervision of masters and doctoral students; their ability to conduct empirical research, theoretical/philosophical research, action research, depth interviews, and participative research; their knowledge of research methodology, descriptive statistics, inferential statistics, non-parametric statistics, multivariate statistics, item analysis and factor analysis; their ability to use computer packages such as BMDP, SPSS-X, SAS, NP77A. NP77S, NP50 and STAT GRAPHICS, and their ability to interpret the computer output. An estimate was also requested of the average number of hours they spent in the supervision of a masters student writing a *full thesis*, and a doctoral student writing a dissertation.

The sample

A random sample of 120 tutors in the human sciences at a South African university was drawn. Eighty one questionnaires were returned in time for the statistical analyses.

The academic qualifications of the tutors are depicted in Figure 1. From inspection of Figure 1 it is apparent that the majority of tutors have masters and doctors degrees.

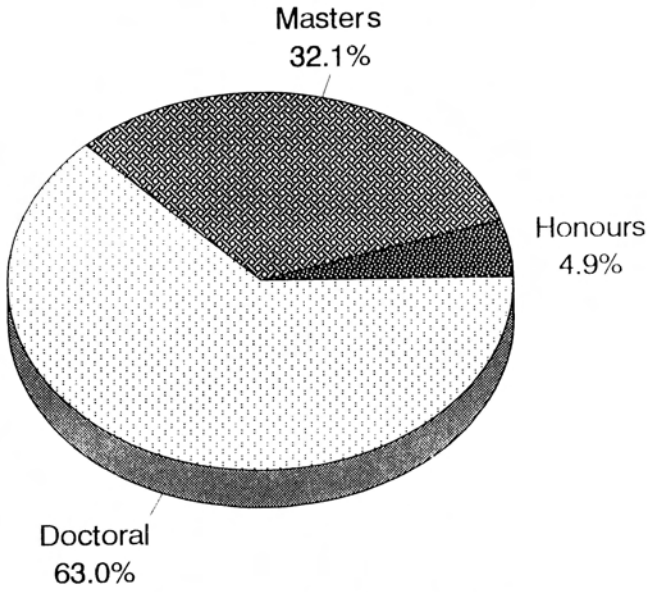

Figure 1: Academic qualifications

Statistical analysis

The means, standard deviations, medians, and ranges of the various survey variables were computed. The variables were also intercorrelated and factor analysed in order to see what variables cluster together. Stepwise regression analyses were done to predict the tutor's **research output** (a composite score comprising number of publications and number of masters and doctoral students who completed their studies under the supervision of a particular tutor) and **ability to plan and conduct empirical research** (Q11).

RESULTS

Descriptive statistics

The descriptive statistics of the various survey variables are given in Table 1. From the table it can be seen that the median *number of publications* is four, with a range of 44; the median number of *masters students* who *completed* their theses under the supervision of a particular tutor is five, with a range of 40; the median number of *doctoral students* who *completed* their dissertations under the supervision of a particular tutor is zero, with a range of 16.

Most of the tutors rated themselves high (medians of 5 to 6) as far as their knowledge of *research methodology* and their *ability to plan and conduct research*, is concerned (see Table 1: Questions 11 to 18). They rated themselves generally lower (medians of 3 to 4) as far as their knowledge of statistics and psychometrics (*research technology)* is concerned (see Table 1: Questions 19 to 26).

The median value for the *average number of hours* spent supervising a masters thesis is 60 hours, with a range of 290 hours. And the median number of hours spent supervising a doctoral dissertation is 120 hours, with a range of 375 hours.

Research output

The distribution of the number of publications of tutors and the number of masters and doctoral students who have com-

TABLE 1:
DESCRIPTIVE STATISTICS OF SURVEY VARIABLES

	SURVEY VARIABLES	MEAN	SD	MEDIAN	MAXIMUM	MINIMUM	RANGE
Q 4.	Number of publications	7,617	9,092	4,000	44,000	0,000	44,000
Q 5.	Number of completed masters theses	9,086	10,060	5,000	40,000	0,000	40,000
Q 6.	Number of completed doctoral dissertations	1,654	3,317	0,000	16,000	0,000	16,000
Q 7.	Years teaching experience: pre-graduate research methodology	4,568	6,571	1,000	23,000	0,000	23,000
Q 8.	Years teaching experience: post-graduate research methodology	4,457	5,946	1,000	20,000	0,000	20,000
Q 9.	Years supervision: masters students	7,247	6,222	5,000	28,000	0,000	28,000
Q10.	Years supervision: doctoral students	3,469	5,388	1,000	26,000	0,000	26,000
Q11.	Planning and conducting empirical research	4,988	1,545	5,000	7,000	1,000	6,000
Q12.	Conducting theoretical/philosophical research	5,642	1,186	6,000	7,000	2,000	5,000
Q13.	Conducting action research	4,926	1,595	5,000	7,000	1,000	6,000
Q14.	Conducting depth interviews	5,062	1,668	6,000	7,000	1,000	6,000
Q15.	Conducting participative research	4,938	1,486	5,000	7,000	1,000	6,000
Q16.	Knowledge of methodology: qualitative research	4,802	1,503	5,000	7,000	1,000	6,000
Q17.	Knowledge of methodology: human sciences	5,074	1,273	5,000	7,000	1,000	6,000
Q18.	Knowledge of methodology: own discipline	5,642	1,144	6,000	7,000	2,000	5,000
Q19.	Knowledge of descriptive statistics	4,321	1,809	4,000	7,000	1,000	6,000
Q20.	Knowledge of inferential statistics	3,519	1,740	3,000	7,000	1,000	6,000
Q21.	Knowledge of non-parametric statistics	3,333	1,746	3,000	7,000	1,000	6,000
Q22.	Knowledge of multivariate statistics	3,160	1,946	3,000	7,000	1,000	6,000
Q23.	Knowledge of item analysis	3,481	1,865	3,000	7,000	1,000	6,000
Q24.	Knowledge of factor analysis	3,420	1,816	3,000	7,000	1,000	6,000
Q26.	Ability to interpret results	3,358	2,051	3,000	7,000	1,000	6,000
Q27.	Hours supervision: masters thesis	88,441	65,670	60,000	300,000	10,000	290,000
Q28.	Hours supervision: doctoral dissertation	158,026	98,787	120,000	400,000	25,000	375,000

pleted their studies are given in Figure 2. The figure shows that 12 tutors have no publications at all and that 38 tutors have between one and five publications. Only six tutors have more than 20 publications. The figure shows that 15 tutors have no masters students, and that only five tutors have more than 25 students who have completed their studies. From the figure it is clear that the majority of tutors (49) have no doctoral students who have completed their studies.

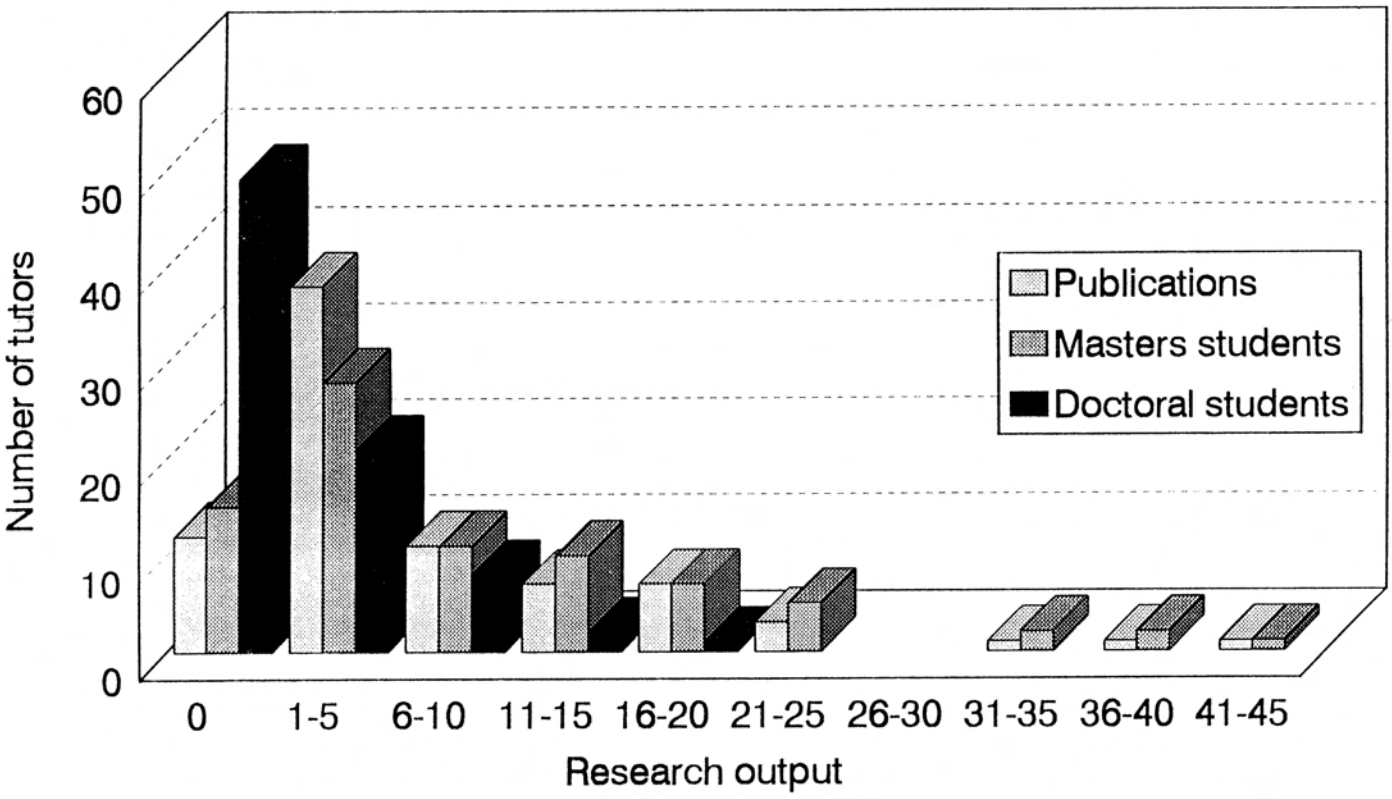

Figure 2: Number of publications, masters and doctoral students

The number of publications, the number of masters and of doctoral students who have completed their studies are functions of the periods of time tutors have been publishing or the period of time they have been supervising post-graduate students. For comparative purposes standardised measures have to be designed. This was done by dividing the number of publications and the number of masters students of each tutor by the number of years the tutor has been active in supervising the research of masters students. Similarly, the number of doctoral students of each tutor was divided by the number of years the tutor has been active in the supervision of doctoral students.

The resulting indices are shown in Table 2. As can be seen the indices for the number of publications, number of masters and number of doctoral students yielded means of 1,046; 1,195 and 0,395 with ranges of 5,000; 4,250 and 2,000, respectively.

TABLE 2:
DESCRIPTIVE STATISTICS OF STANDARDISED MEASURES

STANDARDISED VARIABLES	MEAN	SD	MEDIAN	MAXIMUM	MINIMUM	RANGE
1. Publications per unit time	1,046	0,969	0,800	5,000	0,000	5,000
2. Masters theses per year	1,195	0,955	1,000	4,250	0,000	4,250
3. Doctoral dissertations per year	0,395	0,436	0,273	2,000	0,000	2,000
4. Composite score: Statistics & psychometrics	24,593	11,002	23,000	49,000	7,000	42,000
5. Composite score: Ability to do research	41,074	8,309	42,000	56,000	19,000	37,000

Knowledge of statistics and psychometrics
In order to gauge the tutors' knowledge of statistics and psychometrics, their ratings on Q19 to Q25 and Q26 were summated. This yielded a mean of 24,593 with a maximum of 49,000. The range of scores was 42,000 (see Table 2). From this it is clear that the tutors' knowledge of statistics and psychometrics is rather poor.

Knowledge of research methodology and ability to plan and conduct research
In order to assess the tutors' knowledge of research methodology and their ability to plan and conduct research, their ratings on Q11 to Q18 were summated. This yielded a mean of 41,074 with a maximum of 56. The range of scores was 37,000 (see Table 2). From this it is clear that the tutors consider themselves well equipped to conduct research.

Factor analysis
In order to determine which variables cluster together, the survey variables were intercorrelated and subjected to a factor analysis. The characteristic roots of the *unreduced* intercorrelation matrix were determined and yielded five roots greater than unity. According to the criterion (roots $\geq$ 1,000) five factors were postulated (Guttman, 1954; Kaiser, 1961 & Kaiser, 1970). Five factors were accordingly extracted and rotated to simple structure with the aid of the Varimax procedure. This resulted in a factor fission – one of the factors split into two yielding several variables with loadings on *both* factors. A Scree test (Cattell, 1966) was done which suggested *four* factors (see Figure 3). The analysis was accordingly repeated and the four

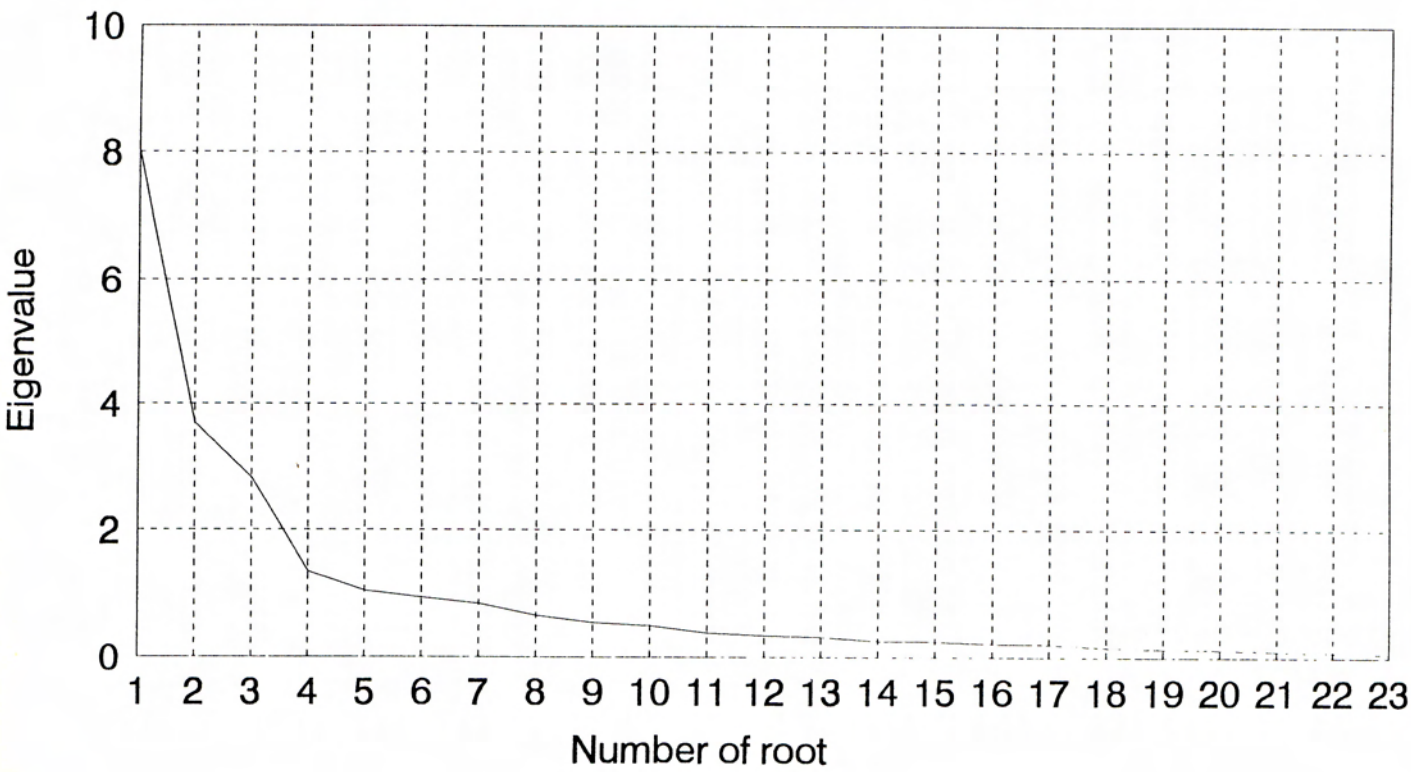

Figure 3: Scree test

factor solution was found to be highly acceptable. The rotated factor matrix is given in Table 3. As can be seen, the following variables have high loadings on

Factor 1 (which can be labelled **knowledge of research technology**):

1. Ability to conduct empirical research	0,500
2. Knowledge of descriptive statistics	0,829
3. Knowledge of inferential statistics	0,914
4. Knowledge of non-parametric statistics	0,881
5. Knowledge of multivariate statistics	0,882
6. Knowledge of item analysis	0,608
7. Knowledge of factor analysis	0,756
8. Ability to interpret the results of the analysis	0,736

Table 3 shows that the following variables have high loadings on Factor 2 (which can be labelled **research output**):

1. Academic qualifications	0,421
2. Number of publications	0,740
3. Number of completed masters theses	0,779
4. Number of completed doctoral dissertations	0,846
5. Teaching post-graduate research methodology	0,379
6. Number of years supervision of masters students	0,890
7. Number of years supervision of doctoral students	0,894

TABLE 3:
ROTATED FACTOR MATRIX (VARIMAX)

	SURVEY VARIABLES	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	hj^2
Q3	Academic qualifications	0,052	**0,421**	0,278	0,117	**0,2709**
Q4	Number of publications	0,175	**0,740**	0,095	0,226	0,6385
Q5	Number of completed masters theses	0,246	**0,779**	0,050	−0,059	0,6739
Q6	Number of completed doctoral dissertations	0,136	**0,846**	0,094	0,075	0,7479
Q7	Teaching pre-graduate research methodology	0,007	0,254	0,153	**0,858**	0,8250
Q8	Teaching post-graduate research methodology	0,033	**0,379**	0,238	**0,684**	0,6698
Q9	Supervision of masters students (years)	0,063	**0,890**	0,075	0,221	0,8503
Q10	Supervision of doctoral students (years)	0,037	**0,894**	0,111	0,145	0,8335
Q11	Conducting empirical research	**0,500**	0,072	**0,523**	0,130	0,5462
Q12	Conducting theoretical/philosophical research	−0,034	0,131	**0,484**	0,003	**0,2523**
Q13	Conducting action research	0,243	−0,009	**0,710**	−0,028	0,5642
Q14	Conducting depth interviews	0,088	0,102	**0,747**	−0,012	0,5760
Q15	Conducting participative research	0,162	0,083	**0,789**	0,040	0,6572
Q16	Methodology of qualitative research	0,248	0,022	**0,604**	0,237	0,4834
Q17	Methodology of human sciences	0,124	0,223	**0,588**	0,206	0,4541
Q18	Methodology of own discipline	0,256	0,073	**0,630**	**0,329**	0,5756
Q19	Descriptive statistics	**0,829**	0,065	0,202	−0,008	0,7319
Q20	Inferential statistics	**0,914**	−0,017	0,038	0,073	0,8426
Q21	Non-parametric statistics	**0,881**	0,241	0,091	0,071	0,8480
Q22	Multivariate statistics	**0,882**	0,117	0,075	0,126	0,8133
Q23	Item analysis	**0,608**	0,221	0,207	−0,089	0,4691
Q24	Factor analysis	**0,756**	0,103	0,173	−0,072	0,6175
Q26	Interpretation of results	**0,736**	0,094	0,254	0,066	0,6188

The following variables have high loadings on Factor 3 (which can be labelled **knowledge of research methodology and ability to conduct research**):

1. Ability to conduct empirical research 0,523
2. Ability to conduct theoretical/philosophical research 0,484
3. Ability to conduct action research 0,710
4. Ability to conduct depth interviews 0,747
5. Ability to conduct participative research 0,789
6. Knowledge of the methodology of qualitative research 0,604
7. Knowledge of the research methodology of the human sciences 0,588
8. Knowledge of the research methodology of own discipline 0,630

The following variables have high loadings on Factor 4 (which can be labelled **teaching experience in research methodology**):

1. Experience in teaching pre-graduate research methodology 0,858
2. Experience in teaching post-graduate research methodology 0,684
3. Knowledge of research methodology of own discipline 0,329

Regression analyses

From the Survey Questionnaire it was possible to obtain two different criterion measures. The first is a self-rating of the tutors as to how well they can conduct empirical research (perceived ability to conduct empirical research). The second measure was constructed by standardising the number of publications, the number of masters and the number of doctoral students who completed their studies under the guidance of a particular tutor. Each measure was standardised with a mean of 50 and a standard deviation of 10. A composite score was then formed by adding the three standard scores. This composite score gives a fairly objective measure of the "research output" of the tutors.

Two stepwise regression analyses were done. In the first analysis "perceived ability to conduct empirical research" served as dependent variable and in the second analysis the composite score (research output) was used. All the variables in the Survey Questionnaire, with the exception of academic qualifications (Q3) and variables Q4, Q5, Q6, Q9, Q10, Q27 and Q28 (see Table 1) served as predictors. Academic qualifications were excluded because most universities require promoters to have a doctors degree. Variables Q4, Q5 and Q6 were used in the construction of the criterion measure as such. Variables Q9 and Q10 are time measures and must necessarily correlate with the research output of the tutors. Variables Q27 and Q28 were not considered relevant for the purpose of the regression analyses.

TABLE 4
STEPWISE REGRESSION: DEPENDENT VARIABLE (ABILITY TO DO RESEARCH)

Multiple R:	**0,7257**
R Square:	0,5267
Adjusted R Square:	0,5082
Standard Error:	1,0835

ANALYSIS OF VARIANCE

Source of variation	DF	Sum of squares	Mean square
Regression	3	100,5843	33,5281
Residual	77	90,4034	1,1741

F = 28,5572; p(F) < 0,0001

VARIABLES IN THE EQUATION

INDEPENDENT VARIABLES	B	SE B	Beta	t-value	P
Q18 : Methodology of own discipline	0,4523	0,1224	0,3348	3,696	0,0004
Q19 : Descriptive statistics	0,2791	0,0744	0,3267	3,752	0,0003
Q13 : Conducting action research	0,2659	0,0892	0,2746	2,983	0,0038
(Constant)	−0,0805	0,6219		−0,129	0,8974

The results of the regression analysis of the survey variables on "perceived ability to conduct empirical research" are given in Table 4. The table indicates that only three predictor varibles (methology of own discipline, descriptive statistics and conducting action research) were included in the regression equation. A multiple correlation of 0,7257 was obtained, indicating that 52,67 percent of the variance in "perceived ability to conduct empirical research can be accounted for by the three perdictor variables. From the analysis of variance it is clear that the *linear regression* accounts for a statistically significant proportion of the total variance ($F = 28,5572$; $df_1 = 3$ and $df_2 = 77$; $p(F) < 0,0001$). All the regression coefficients are statistically significant, but the constant is not.

An estimate of a tutor's "ability to plan and conduct research" can be obtained from the following regression equation:

$$\hat{Y} = 0,4523Q_{18} + 0,2791Q_{19} + 0,2659Q_{13} - 0,0805$$

The results of the regression analysis of the survey variables on "research output", are given in Table 5. The table indicates that only three predictor variables (teaching post-graduate research methodology, non-parametric statistics and inferential statistics) were included in the regression equation. A multiple correlation of 0,5824 was obtained, indicating that 33,92 percent of the variance in "research output" can be accounted for by the three predictor variables. From the analysis of variance it is clear that the linear regression accounts for a statistically significant proportion of the total variance ($F = 13,1746$; $df_1 = 3$ and $df_2 = 77$; $p(F) < 0,0001$). All the regression coefficients and the constant are statistically significant.

TABLE 5
STEPWISE REGRESSION: DEPENDENT VARIABLE (RESEARCH OUTPUT)

Multiple R:	**0,5824**
R Square:	0,3392
Adjusted R Square:	0,3135
Standard Error:	21,9024

ANALYSIS OF VARIANCE

Source of variation	DF	Sum of squares	Mean square
Regression	3	18960,1744	6320,0581
Residual	77	36938,0106	479,7144

$F = 13,1746$; $p(F) < 0,0001$

VARIABLES IN THE EQUATION

INDEPENDENT VARIABLES	B	SE B	Beta	t-value	P
Q8 : Teaching post-graduate research methodology	1,4039	0,4304	0,3158	3,262	0,0017
Q21 : Non-parametric statistics	10,1573	2,6863	0,6711	3,781	0,0003
Q20 : Inferential statistics	−5,8005	2,6400	−0,3818	−2,197	0,0310
(Constant)	130,2965	5,7361		22,715	0,0000

An estimate of a tutor's "research output" can be obtained from the following regression equation:

$$\hat{Y} = 1,4039Q_8 + 10,1573Q_{21} - 5,8005Q_{20} + 130,2965$$

From the *standardised* regression coefficients (βeta coefficients) it is clear that knowledge of non-parametric statistics carries a greater weight in the equation than the other two predictors. The negative weight of inferential statistics should be interpreted with caution. It does not mean that the poorer the knowledge of inferential statistics, the better would be the "research output"! It merely reflects the complex interrelationships amongst the predictor variables on the one hand, and the predictor-criterion correlations on the other hand.

DISCUSSION AND CONCLUSIONS

From the results reported in Table 2 it is clear that most of the tutors are not very active as far as publishing is concerned, that the rate with which masters students complete their studies is very slow and that the rate of progress of doctoral students is poor. This confirms the findings of Smit and Tyson (1990).

The theoretical distinction between *research methology* and *research technology* which was drawn in the introduction to this paper, was born out by the results of the factor analysis (see the items above which loaded high on Factors 1 and 3). The implication of this distinction is evident from Table 1, where it can be seen that most of the tutors felt comfortable in the area of *research methodology* (medians of 5 to 6) but generally less so in the area of *research technology* (medians of 3 to 4). A similar picture emerges from Table 2 when the mean of *research methodology* ($\bar{X} = 41,074$; maximum = 56) is compared with the mean of *research technology* ($\bar{X} = 24,593$; maximum = 49).

From the regression equation, when predicting "perceived ability to conduct empirical research" (dependent variable), it is striking that two of the three variables in the equation are included in Factor 3 (research methodology). It is also noticeable that two of the three variables in the equation, when predicting the objective measure "research output", are included in Factor 1 (research technology). The two regression analyses furthermore indicate that the prediction of the "subjective" criterion ($R = 0,73$) is more accurate than the prediction of the objective criterion ($\hat{R} = 0,58$) – this could have been anticipated, since in the former instance both the dependent and independent variables are based on self-ratings.

The findings of the study presents a conflicting picture. On the one hand tutors have high academic qualifications and feel comfortable in the area of research methodology. Yet on the other hand their research output tends to be low, and they appear to lack knowledge and expertise in the area of research technology.

On the basis of this study it can be argued that, in order to improve the research performance of students and tutors alike, the "fostering of a research climate" on campuses should be based on adequate "training" – particularly in the area of research technology. In this regard those responsible for research training should capitalise on the availability of statistical computer programmes. The opportunity exists to distinguish between, and to provide training for (a) researchers as *users* of computer programmes and (b) researchers as *providers* of information to further refine such programmes.

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