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The Triple Helix of Size, Diversity and Collaboration in Research Productivity

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Abstract: *This study analysed the effects of size, diversity and collaboration on departmental research productivity. A premier institution offering academic, research, clinical services and public education in communication disorders was selected for the study. The data set comprised of 257 funded projects by 41 teaching faculty from 2005-06 to 2014-15. Team size was reckoned in terms of total faculty size, performers size and number of doctorates in the team. The diversity attributes studied included diversity in age, gender, rank, qualification, diversity in years of teaching experience (YTE) and clinical experience (YCE). The influence of size and diversity differed among the departments. A trend of diminishing marginal returns was observed beyond a certain department size. The performers size and the ratio of performers size to team size captured the essence of the size effect on research productivity. The performers were marked by a moderate level of diversity in terms of age, gender, rank, qualification and years of clinical experience. A linear trend was seen between the number of doctorates, professional networking and research productivity score. The inter-correlations revealed that having more doctorates lead to higher performers ratio and increased professional networking in turn resulting in higher research productivity. The performers size had significant positive correlation with diversity and professional networking establishing the positive nexus between size, diversity and collaboration.*

Keywords: *departmental research productivity, department size, team diversity, professional networking, faculty research productivity.*

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I. Introduction

The present era is an era of team science. There is an apparent shift in research activities in science from a solo, individualistic style to a collaborative team-based model (Wuchty, Jones & Uzzi, 2007). There is also a change in the way one perceives the basic organisational units. The building blocks of an organisation are no longer individuals; it is rather teams and groups such as project teams and research groups, which are viewed as performing units. As Guzzo and Shea (1992) put it, "Today, the group is not the context, it is the kernel."

The aggregate of individual competencies represents the stock of human capital of an organisation. It is held that human capital accumulation can boost productivity at the individual, departmental and institutional level (Greve & Benassi, 2003). The potential of human capital is referred in terms of the core competences of an organisation and collective competences in the context of aggregate units such as an institution or a department (Lepak & Snell, 1999, Edvinsson & Malone, 1997).

Among the organizational variables, the size of an institution or a department is considered to be one of the critical variables influencing research productivity (Pelz & Andrews, 1966; Dundar & Lewis, 1998).Bland and Ruffin (1992) after a review of articles and books on research productivity reported that "sufficient size and diversity of the research group" is one of the consistent characteristics that mark a conducive research environment. Bland, Center, Finstad, Risbey, and Staples (2005) argued that the size of a research group is a facilitator and one of the key predictors of institutional research productivity explaining that when the size is at or above a "critical mass", the group remains stable.

Similarly, social and functional diversity in teams have also gained the attention of productivity researchers in the past. Diversity acknowledges and appreciates the differences in the group composition in terms of age, gender, rank, educational background, levels of experience etc. Theoretically, diversity in work groups has the potential to render positive as well as negative effects. While the positive outcomes could arise from broader perspectives, the adverse effects could be because of issues relating to group cohesion and poorer communication in heterogeneous groups. (Christian, Porter & Moffitt, 2006). Diversity has been a "nice to do" rather than a "need to do" and organisations work towards leveraging these differences to enhance their performance (Venkatesh, 2017).

The individual attributes that reflect the context of diversity within a team have been characterised by Jackson and Schuler (1995) as readily detectable attributes (such as age, gender, etc.) or underlying attributes (experience, skills, etc). The attributes which most diversity research studies have focused include "age, gender, ethnicity, functional background and educational background." (Christian, Porter & Moffitt, 2006). According to Bowers, Pharmer and Salas (2000), the effects of similarity (or dissimilarity) across the different attributes that determine the context of diversity in teams can provide a useful framework for understanding the relationships between the individual attributes, team diversity and performance.

It is also widely perceived that collaboration in research is "a good thing" and that it needs to be encouraged. Production of scientific knowledge is deeply embedded in social structures and practices among scientists (Crane, 1972; Katz & Martin, 1997) and scientific research is a social activity (Kamesh, 2010). Through collaboration, scientists, build, expand and maintain their social capital that helps uncover novel research questions and facilitate future research collaboration (He, Gang, & Cambell-Hunt, 2009).

Beaver and Rosen (1979) posited that scientific collaboration represented a response to increasing professionalization of science. They explained that collaboration lead to professional advancement as networking with scientific elite enhances the visibility of budding researchers. Collaboration also increases the knowledge by offering access to resources: information and equipment. Collaboration among researchers is also an important part of maturation of science (Kamesh, 2010).

Research Gap and Contribution of the study

Despite the significance of size and diversity of the research groups in research productivity, there have been limited studies on this topic in Asian or Indian context. Further, studies exploring the mutual influence of size, diversity and collaboration in the context of research productivity have also been very few in the research productivity literature. It is against this background that the present study is attempted. It is also the first of its kind in the discipline of speech, language and hearing sciences which comes under the allied health category. The findings of this study are likely to provide an insight into research group compositions and useful to the policy makers and academic administrators for adopting strategies to enhance research productivity.

Objectives of the study

The objectives of the study included investigation of the effects of size, diversity and collaboration at the department level on productivity in funded research projects in a Higher Education Institution (HEI).

Hypotheses

The following null hypotheses were formulated.

H_0 1: There is no association between size and departmental research productivity.

H_0 2: There is no association between diversity and departmental research productivity.

H_0 3: There is no association between collaboration and departmental research productivity

H_0 4: There is no association between size, diversity and collaboration in departmental research productivity.

II. Research Methodology

Research Design: The study was analytical in nature and a longitudinal study was carried out. A premier speech and hearing institution was selected for the study covering the three core departments of Audiology (AUD), Speech-Language Pathology (SLP) and Speech-Language Sciences(SLS). The data on participation of teaching faculty in the core departments in funded research projects and the demographic data were gathered from (i) the institutional website, (ii) the annual reports of the institutions and (iii) mailed questionnaire. While reckoning the research productivity for this purpose, a research productive unit was taken to mean the faculty's contribution in their capacity as principal investigator or a co-investigator. The data were collected for a period of ten years from 2005-06 to 2014-15. The data set comprised of 257 funded projects carried out by 41 teaching faculty.

Metrics: Team size was reckoned in terms of the total faculty size, performers size and the number of doctorate holders in the team. The attributes of diversity which were reckoned included age diversity, gender diversity, rank diversity, qualification diversity, diversity in years of teaching experience (YTE) and clinical experience (YCE). Further to gain a deeper understanding of the size and diversity-effect at a micro level, the study also investigated the diversity pattern of the performers and non-performers at the department level. The diversity coefficients were calculated using Shannon Index of diversity as follows:

$$\text{Shannon Index (H)} = -\sum_{i=1}^{s} p_i \ln p_i$$ where,

p is the proportion (n/N) of individuals of one particular attributes found (n) divided by the total number of individuals found (N),
ln is the natural log,
∑ is the sum of the calculations, and
s is the number of groups.

Collaboration in the form of professional networking was reckoned in terms of the number of times a faculty had partnered with either professional in their discipline or with professionals outside their discipline.

Research Productivity Score(RP score): With a view to accord differential weightages and to arrive at research productivity score, the metrics and guidelines adopted by the University Grants Commission (UGC) for the Academic Performance Indicators (APIs) was referred to, which was modified suitably for deriving the research productivity score. Extra mural project was given a score of 5 and intra mural project was given a score of 3.

Data analysis: Statistical analysis was done using the software Statistical Package for Social Sciences (SPSS), version 20.0. Test for normality was negative and therefore, non-parametric tests were performed using the SPSS software. To analyse the association of the independent variables, viz., size, diversity and professional networking on the dependent variable: departmental research productivity and the inter relationship between independent variables Spearman's rank correlations were adopted and correlation matrix was drawn.

III. Results and Discussion

Size and Research Productivity: The study revealed several interesting findings: (i) The overall department size i.e., Team Size (TS) had an influence on departmental productivity score in funded research projects. Even while a phenomenon of increase in productivity was observed with increase in size of the faculty, the increase was not proportional; (ii) The association between TS and research productivity varied among departments; (iii) A trend of diminishing marginal returns was observed beyond a certain team size. The results indicated that diminishing marginal returns was observed beyond the department strength of 16 in the department of AUD and beyond the department strength of 9 in the departments of SLP and SLS; (iv) The Performers Size (PS) and the ratio between PS and TS (PS/TS) captured the essence of the size effect on the productivity score than TS as such. (See Figures.1, 2 and 3); (v) A linear trend was seen between the number of doctorates and productivity score and between the number of professional networking and productivity score. The data relating to Size, Collaboration and Diversity in Funded Research Projects is presented in Table 1.

Results of Correlation Analysis

Team Size: Team size was highly correlated with productivity in the department of AUD (r_s =0.757) at 5% significance level. Team size had no significant correlation in the departments of SLP and SLS.

Performers Size: Performers' size was very highly correlated with productivity in the departments of AUD (r_s =0.939), SLP (r_s = 0.988) and SLS (r_s = 0.899) at 1% significance level.

Number of PhD holders: The number of PhD. holders had very high correlation with productivity in the departments of AUD (r_s =0.941), SLP (r_s = 0.903) and SLS (r_s = 0.896). The correlation coefficients were significant with $p< 0.001$. (See Table 2).

Diversity and Research Productivity

The diversity coefficients were calculated not only for the overall department strength (Team), but also in respect of its subsets: performers and non-performers. As the performers population represents the productive group in productivity studies, this can shed light on the degree and pattern of diversity seen among performers. Therefore, for a finer understanding of the diversity effects, the diversity coefficients of the team diversity and the diversity of the performers, non-performers diversity were compared. The study revealed that the influence of diversity on productivity varied among departments. Further, not all diversities affected the productivity at the departmental level uniformly. While the performers were marked by higher diversity in some of the attributes; they were moderately diverse or less diverse in some of the attributes as follows:

Age Diversity: The performers in the department of AUD were least diverse (TD1>NPD1>PD1), but a moderate level of age diversity was seen among the performers in the departments of SLP and SLS (TD1>PD1>NPD1).

Gender Diversity: The performers in all the three departments viz., AUD, SLP and SLS were moderately diverse (TD2>PD2> NPD2).

Rank Diversity: The performers in all the three departments of AUD, SLP and SLS were moderately diverse (TD3>PD3>NPD3).

Qualification Diversity: The performers were moderately diverse in the department of AUD (NPD4>PD4>TD4) and in the department of SLS (TD4>PD4>NPD4). However, a higher degree of diversity was seen among performers in the department of SLP in terms of qualification (PD4>TD4>NPD4).

YTE Diversity: The performers in all the three departments viz., AUD, SLP and SLS were least diverse (NPD5>TD5> PD5) with respect to Years of Teaching Experience.

YCE Diversity: With respect to Years of Clinical Experience, the performers in all the three departments viz., AUD, SLP and SLS were moderately diverse (TD6>PD6> NPD6).(See Appendix 1).

Table no 1 : Size, Collaboration and Diversity in Funded Research Projects

Year	TS	PS	PS/TS	PhDs	PN	PD1	PD2	PD3	PD4	PD5	PD6	RP Score
	(Nos.)	(Nos.)	(in %)	(Nos.)	(Nos.)	(Diversity Coefficients)						
Dept. of Audiology												
2005-06	6	1	16.67	1	1	0.00	0.00	0.00	0.00	0.00	0.00	5
2006-07	6	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0
2007-08	9	1	11.11	0	1	0.00	0.00	0.00	0.00	0.00	0.00	3
2008-09	8	0	0.00	0	1	0.00	0.00	0.00	0.00	0.00	0.00	5
2009-10	8	2	25.00	2	6	0.69	0.69	0.00	0.00	0.00	0.69	12
2010-11	14	8	57.14	5	8	0.90	1.07	0.66	0.90	0.90	1.07	32
2011-12	16	14	87.50	7	21	1.25	1.03	0.69	0.90	0.90	1.38	60
2012-13	16	10	62.50	5	20	1.24	1.05	0.61	0.95	0.67	1.28	64
2013-14	19	5	26.32	3	5	0.95	0.95	0.67	0.95	0.67	0.50	22
2014-15	19	10	5 2.63	5	12	1.19	1.09	0.61	0.50	1.05	1.17	39
Dept. of Speech-Language Pathology												
2005-06	6	2	33.33	2	1	0.00	0.69	0.00	0.69	0.00	0.00	11
2006-07	6	4	66.67	4	3	0.56	1.39	0.00	0.56	0.00	0.56	17
2007-08	7	3	42.86	3	5	0.64	1.10	0.00	0.64	0.00	0.64	12
2008-09	7	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0
2009-10	7	7	100.00	5	12	1.47	1.47	0.41	1.08	0.60	1.35	33
2010-11	9	9	100.00	6	19	1.31	1.30	0.53	0.99	0.64	1.37	64
2011-12	11	8	72.73	6	20	1.21	1.49	0.56	1.04	0.66	1.32	61
2012-13	9	4	44.44	3	3	1.04	1.04	0.69	1.04	0.56	1.04	14
2013-14	10	4	40.00	3	8	0.95	0.95	0.50	0.95	0.67	1.33	21
2014-15	11	5	45.45	3	6	1.33	1.33	0.50	1.05	0.50	1.33	29
Dept. of Speech-Language Sciences												
2005-06	4	1	25.00	1	2	0.00	0.00	0.00	0.00	0.00	0.00	13
2006-07	3	1	33.33	1	0	0.00	0.00	0.00	0.00	0.00	0.00	3
2007-08	4	2	50.00	2	4	0.69	0.69	0.00	0.69	0.00	0.69	19
2008-09	5	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0
2009-10	5	3	60.00	3	4	0.64	0.64	0.00	0.64	0.00	0.64	18
2010-11	9	7	77.78	4	10	1.00	1.28	0.68	0.68	0.96	1.07	41
2011-12	10	4	40.00	4	6	1.04	0.56	0.56	1.04	0.00	1.03	20
2012-13	9	7	77.78	5	6	1.55	1.35	0.68	1.08	0.60	1.28	26
2013-14	11	3	27.27	2	4	1.10	1.10	0.64	0.64	0.64	1.09	11
2014-15	11	6	54.55	5	8	1.06	1.06	0.50	1.06	0.50	1.33	28

TS: Team Size; PS: Performers Size; PN: Professional Networking; PD1: Performers Age diversity; PD2: Performers Gender diversity; PD3: Performers Rank Diversity; PD4: Performers Qualification Diversity; PD5: Performers diversity in Years of Teaching Experience; PD6: Performers diversity in Years of Clinical Experience

Table no 2: Size and productivity: Correlation

Department	RPUs	Team Size(TS)	Performers Size (PS)	No. of PhDs
AUD	89	0.757*	0.939**	0.941**
SLP	107	0.582 (NS)	0.988**	0.903**
SLS	61	0.472 (NS)	0.899**	0.896**

** Correlation significant at 1% level; * Correlation significant at 5% level; NS: Not Significant

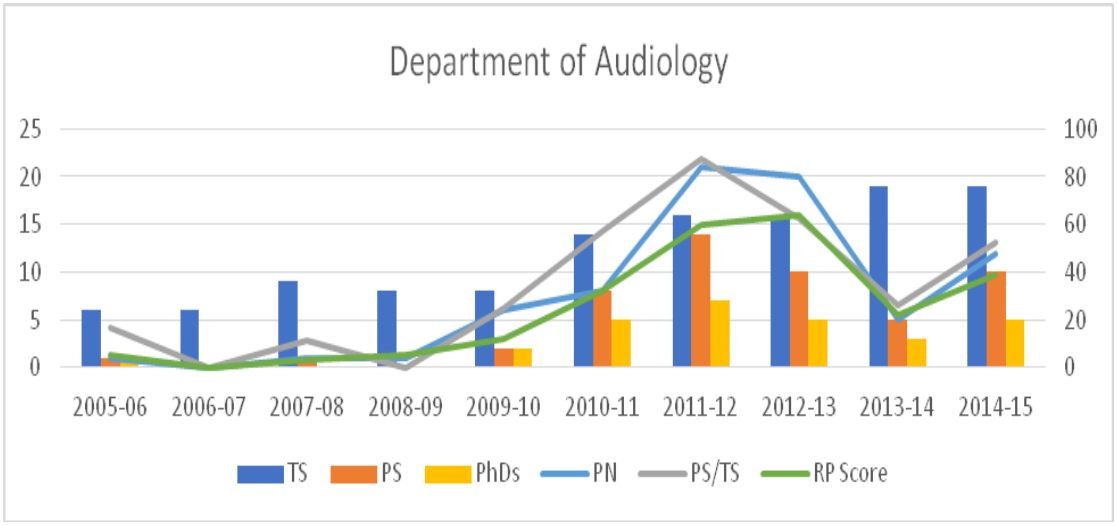

Figure 1: Size, networking and productivity: Department of Audiology

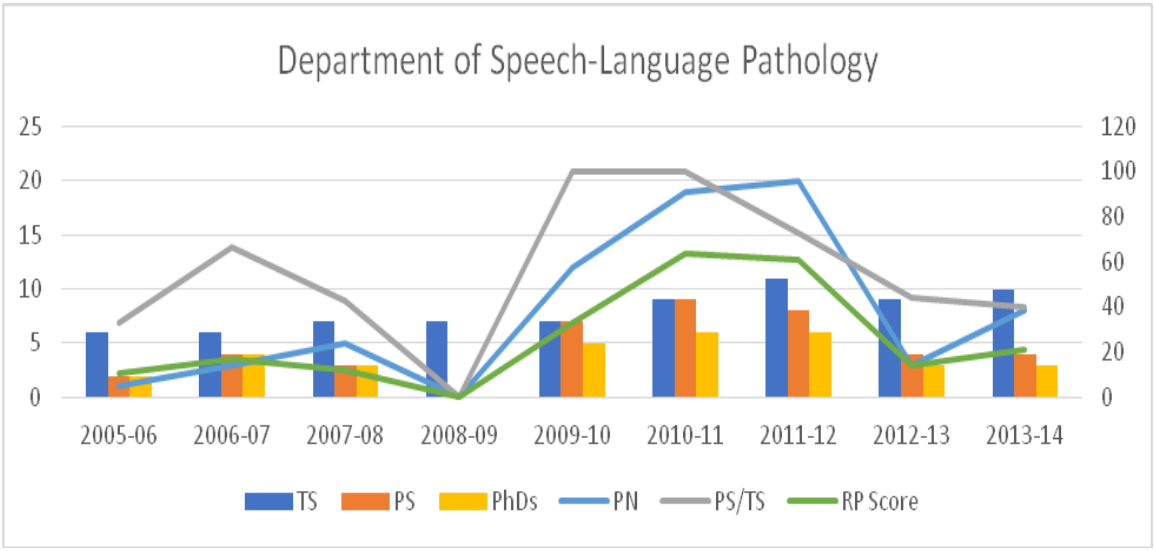

Figure 2: Size, networking and productivity: Department of Speech-Language Pathology

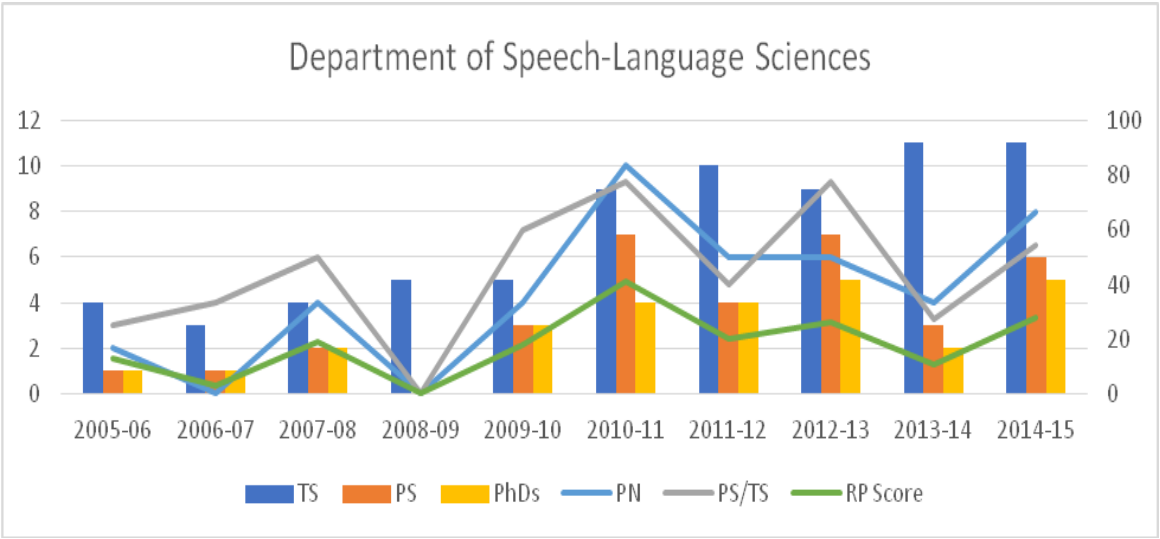

Figure 3: Size, networking and productivity: Department of Speech-Language Sciences

Results of Correlation Analysis

Team diversity: Only team gender diversity was correlated significantly in the department of Audiology, *albeit* negatively. None of the team diversities were significantly correlated in the department of SLP. In the department of SLS, high correlation was seen between productivity and diversity in qualification, years of clinical experience (See Table 3).

Table no 3: Team diversity and productivity: Correlation

Departments	RPUs	Age diversity	Gender diversity	Rank diversity	Qualification diversity	YTE diversity	YCE diversity
AUD	89	NS	-0.657*	-NS	NS	NS	NS
SLP	107	NS	NS	NS	NS	NS	NS
SLS	61	NS	NS	NS	0.736*	NS	0.762*

** Correlation significant at 1% level; * Correlation significant at 5% level; NS: Not Significant

Performers diversity: A high correlation was seen with respect to productivity and all the six diversities *viz.*, diversity in age, gender, rank, qualification and years of teaching and clinical experience in the departments of audiology and speech-language pathology. Four of the diversities, *viz.*, Gender diversity, Rank diversity, Qualification diversity and diversity in years of clinical experience were found to be significantly correlated with productivity in the department of SLS. (See Table 4).

Table no 4: Performers diversity and productivity: Correlation

Departments	RPUs	Age diversity	Gender diversity	Rank diversity	Qualification diversity	YTE diversity	YCE diversity
AUD	89	0.947**	0.872**	0.774**	0.816**	0.816**	0.947**
SLP	107	0.839**	0.758*	0.634*	0.681*	0.763*	0.884**
SLS	61	NS	0.706*	0.642*	0.891**	NS	0.730*

** Correlation significant at 1% level; * Correlation significant at 5% level; NS: Not Significant

It is pertinent to note that the performers were marked by a moderate level of diversity in terms of age, gender, rank, qualification and years of clinical experience as seen from the diversity coefficients (Appendix I). Therefore the high correlation between performers diversity and productivity signifies that moderate level of diversity can lead to higher productivity.

Collaboration and Research Productivity

The findings of the present study also brought into focus the significance of collaboration in enhancing research productivity.

Professional networking was strongly correlated with research productivity in all the three departments. The correlation coefficients ranged from 0.93 to 0.97 at 1% significance level, signifying a high degree of collaboration in the conducting of funded research projects. (AUD (r_s =0.941); SLP (r_s = 0.903); and SLS (r_s = 0.896).

Inter-correlations between Size, Diversity and Collaboration

The inter-correlations between size, diversity and collaboration were studied on the data comprising of 30 teams (three departments over a period of ten years) which revealed the following:

(i) A high positive correlation was seen between number of doctorates and professional networking.(r_s =0.91;p<0.001);

(ii) The PS/ TS ratio had a high correlation with the number of doctorates. (r_s= 0.91;p<0.001) ;

(iii). The size of the faculty, especially, performers size and PS/TS ratio had high correlation with professional networking. (r_s= 0.93;p<0.001; and r_s= 0.80; p<0.001 respectively).

(iv) A high positive correlation existed between performers age diversity and professional networking (r_s =0.85,p<0.001).

These inter-correlations signify that having more doctorates leads to higher PS/TS ratio and increased professional networking, in turn resulting in higher research productivity.

(v) The correlation matrix also revealed that the team size and especially, performers size had significant positive correlation with diversity of the performers and professional networking at 1% significance level(p<0.001) establishing the positive nexus between size, diversity and collaboration. (See Appendix-II).

Previous studies which had investigated the correlation between the size of departments or research groups and research productivity did not reveal any evident tendencies (Zainab, 1999). The department size was reported to be a poor predictor of research productivity Blackburn, Behymer and Hall (1978). However, the productivity researchers were unanimous that a minimum size or a critical mass was perhaps necessary (Gallant & Prothero, 1972). Dundar and Lewis (1998), Aksnes, Rorstad and Sivertsen (2011) reported that research

output was related to the size of the team but with no evidence apparently in support of economies of scale. Similarly, it was observed by many researchers that beyond a threshold, productivity, in fact, witnessed a pattern of a downward slide. (Blackburn, Behymer & Hall, 1978; Stankiewicz, 1979; von Tuzelmann, Ranga, Martin & Geuna, 2003). Aksnes, Rorstad and Sivertsen (2011) also noted that the results of the association between size and research performance depended on the unit of analysis viz., whether it is a research group or a department.

The present study revealed that size of doctorates emerged as having a strong correlation across departments highlighting the importance to have more doctorates. The trend of increase in research productivity score with increase in the number of PhD as above is consistent with the findings of Verbree (2015).

Diversity, also referred as heterogeneity, per se promotes absorption of various characteristics into the team through the inclusion of persons with different age-groups, gender, functional backgrounds and educational backgrounds. Diversity is also believed to be related to performance through enhanced problem solving and offering of creative solutions.

The studies on combined effects of diversity in workgroups are not well established (Milliken & Martins, 1996) and have produced conflicting and mixed results. Research seeks solutions to complex and intriguing issues, and it is held that diverse teams are more likely to have better access to essential " information" that is a sine qua non for solving complex problems (Leonard, Levine & Joshi, 2004).

Wood (1987) who had carried out an extensive review of the literature on the effect of gender composition on team performance reported significant differences in performance at the group level. Earlier findings had also revealed that absorbing the various characteristics in the workforce "cultivates greater knowledge, creativity and innovation among the team members" (Watson, Kumar, & Michaelsen, 1993; Ismail & Arokiasamy, 2008; Marimuthu et al., 2009). Diversity has also been reported to be linked positively "to better problem solving and offering of creative solutions" (Michel & Hambrick, 1992), making itself relevant in the context of research productivity, which operates in the realm of innovation and creativity. Fursov, Roschina and Balmush (2016) had found that the diversity of research experience had a stronger influence on research productivity.

The findings of this study revealed that while all the diversities do not operate uniformly, nevertheless the effect of diversity has been seen to be positively influencing research productivity.

The findings of the present study also brought into focus the significance of collaboration in enhancing research productivity and consistent with the findings of Ramkumar and Narayanasamy, 2017 who had conducted a scientometric study on the investigation pattern of researchers in speech, language and hearing sciences which had revealed a high degree of collaboration in funded research projects.

As Melin (2000) had concluded, the collaboration among researchers happens due to strong pragmatic reasons. He explained the motives for collaboration in terms of: i) the co-author having special competence; ii) the co-author has special data or equipment; iii) supervisor-student relation; and iv) even social reasons such as being old friends and past collaboration. The benefits of social capital are explained by Kuku, Omonona, Oluwatayo and Ogunleye (2013) and listed in terms of its main effects as follows: "i) getting information; (Granovetter, 1983; Burt, 1992), ii) transfer of knowledge, innovation, and diffusion of technology or practices; (Ahuja, 2000; Brown & Duguid, 1991; Powell, 1998; Wenger, 1998) iii) combining complementary knowledge and helping solving problems (Greve & Salaff, 2001; von Hippel, 1988)".

Research seeks solution to complex problems and social relations could be used to mobilise team members to participate in complex and innovative processes (Greve & Benassi, 2003). The knowledge of the team gets augmented and complemented using team members' social capital. As Greve and Salaff (2001) put it, "A network of individuals has a collective knowledge base, the resultant of which is possessing of more knowledge than that residing within any single individual".

Summary of Test of Hypotheses

1 to H_0 4 that there is no association between size and productivity, diversity and productivity, collaboration and productivity and between size, diversity and collaboration in research productivity at departmental level were rejected as can be seen from the correlation results read with significance tests.

The results of the test of hypotheses indicated that size, diversity and collaboration, individually and mutually do have an association with the departmental research productivity.

IV. Conclusion

There are heightened expectations from HEIs to pursue a research agenda and to transform into "new knowledge generation" centres in today's knowledge era. Thus, in the quest to solve the productivity puzzle and to find out what drives departmental research productivity, the effects of size, diversity and collaboration were investigated. Despite the sample size being small, the findings of this study are likely to provide an insight into research group compositions and useful to the policy makers and academic administrators for adopting strategies to enhance research productivity. However, a deeper study on a larger scale of the effect of size,

diversity and collaboration across disciplines is useful to determine group compositions and is highly recommended.

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Appendix I : A comparison of Team Diversity, Performers Diversity and Non-Performers Diversity in Funded Research Projects

Year	Age Diversity			Gender Diversity			Rank Diversity			Qualification Diversity			YTE Diversity			YCE Diversity		
	TD1	PD1	NPD1	TD2	PD2	NPD2	TD3	PD3	NPD3	TD4	PD4	NPD4	TD5	PD5	NPD5	TD6	PD6	NPD6
	Diversity Coefficients			Diversity Coefficients			Diversity Coefficients			Diversity Coefficients			Diversity Coefficients			Diversity Coefficients		
	Department of Audiology																	
2005-06	1.01	0.00	0.95	1.33	0.00	0.67	0.64	0.00	0.67	1.01	0.00	0.67	0.69	0.00	1.33	1.05	0.00	1.05
2006-07	1.33	0.00	1.33	1.33	0.00	0.64	0.64	0.00	1.01	1.01	0.00	0.69	0.69	0.00	1.33	1.24	0.00	1.24
2007-08	1.06	0.00	1.04	1.21	0.00	0.66	0.64	0.00	0.90	0.85	0.00	1.08	1.06	0.00	0.97	1.06	0.00	1.06
2008-09	1.04	0.00	1.04	0.97	0.00	0.66	0.66	0.00	0.74	0.74	0.00	1.04	1.04	0.00	0.97	1.04	0.00	1.04
2009-10	1.04	0.69	0.87	1.21	0.69	0.69	0.66	0.00	0.64	1.04	0.00	1.01	0.97	0.00	0.87	1.04	0.69	0.87
2010-11	1.15	0.90	1.01	0.89	1.07	0.64	0.69	0.66	0.45	1.08	0.90	1.01	0.6	0.90	0.45	0.89	1.07	0.45
2011-12	1.24	1.25	0.00	0.95	1.03	0.00	0.68	0.69	0.00	0.8	0.90	0.69	1.08	0.90	0.00	1.30	1.38	0.00
2012-13	1.24	1.24	0.87	1.16	1.05	0.64	0.68	0.61	0.45	0.83	0.95	1.09	0.98	0.67	1.01	1.26	1.28	1.01
2013-14	1.19	0.95	1.19	1.19	0.95	0.65	0.66	0.67	0.79	0.84	0.95	0.99	0.95	0.67	1.11	1.19	0.50	0.99
2014-15	1.16	1.19	1.00	1.09	1.09	0.69	0.62	0.61	0.99	0.82	0.50	0.69	0.86	1.05	1.21	1.19	1.17	1.00
Mean	**1.15**	**0.62**	**0.93**	**1.13**	**0.59**	**0.59**	**0.66**	**0.32**	**0.66**	**0.90**	**0.42**	**0.90**	**0.89**	**0.42**	**0.93**	**1.13**	**0.61**	**0.87**
	Department of Speech-Language Pathology																	
2005-06	1.01	0.00	1.04	1.56	0.69	0.56	0.45	0.00	0.00	0.64	0.69	0.00	0.00	0.00	1.04	1.01	0.00	0.56
2006-07	1.01	0.56	0.00	1.56	1.39	0.69	0.45	0.00	0.69	1.01	0.56	0.00	0.00	0.00	0.69	1.01	0.56	0.00
2007-08	1.28	0.64	1.39	1.48	1.10	0.56	0.41	0.00	1.04	1.08	0.64	0.56	0.41	0.00	1.39	1.55	0.64	1.04
2008-09	1.48	0.00	1.48	1.48	0.00	0.41	0.41	0.00	1.08	1.08	0.00	0.79	0.79	0.00	1.48	1.35	0.00	1.35
2009-10	1.48	1.47	0.00	1.48	1.47	0.00	0.41	0.41	0.00	1.08	1.08	0.00	0.59	0.60	0.00	1.35	1.35	1.35
2010-11	1.31	1.31	0.00	1.3	1.30	0.00	0.53	0.53	0.00	0.99	0.99	0.00	0.64	0.64	0.00	1.37	1.37	1.37
2011-12	1.26	1.21	0.00	1.16	1.49	0.64	0.59	0.56	0.00	0.91	1.04	0.64	0.99	0.66	0.00	1.37	1.32	0.69
2012-13	1.52	1.04	1.33	1.27	1.04	0.00	0.53	0.69	0.50	0.99	1.04	0.67	0.64	0.56	0.95	1.58	1.04	1.05
2013-14	1.64	0.95	0.95	1.64	0.95	0.50	0.5	0.50	0.95	1.05	0.95	0.50	0.61	0.67	1.33	1.61	1.33	1.33
2014-15	1.67	1.33	1.33	1.59	1.33	0.69	0.66	0.50	0.64	1.04	1.05	0.69	0.66	0.50	0.87	1.59	1.33	1.24
Mean	**1.37**	**0.85**	**0.75**	**1.45**	**1.08**	**0.41**	**0.49**	**0.32**	**0.49**	**0.98**	**0.80**	**0.39**	**0.53**	**0.36**	**0.78**	**1.38**	**0.89**	**1.00**
	Department of Speech-Language Sciences																	
2005-06	1.04	0.00	1.09	1.04	0.00	0.00	0.00	0.00	0.00	0.56	0.00	0.64	0.69	0.00	0.64	1.39	0.00	1.39
2006-07	0.64	0.00	0.69	0.64	0.00	0.00	0.00	0.00	0.00	0.64	0.00	0.69	0.64	0.00	0.00	1.09	0.00	1.09
2007-08	1.04	0.69	0.69	1.39	0.69	0.00	0.00	0.00	0.69	0.69	0.69	0.69	0.56	0.00	0.69	1.38	0.69	0.69
2008-09	1.33	0.00	1.33	1.33	0.00	0.00	0.00	0.00	0.67	0.67	0.00	0.5	0.50	0.00	1.05	1.33	0.00	1.33
2009-10	0.95	0.64	0.69	0.95	0.64	0.00	0.00	0.00	0.69	0.67	0.64	0.69	0.50	0.00	1.09	1.33	0.64	0.69
2010-11	1.46	1.00	0.69	1.31	1.28	0.69	0.69	0.68	0.69	0.94	0.68	0.69	0.94	0.96	0.59	1.52	1.07	0.69
2011-12	1.42	1.04	0.87	1.28	0.56	0.69	0.67	0.56	0.45	0.89	1.04	1.01	0.89	0.00	0.64	1.47	1.03	0.64
2012-13	1.46	1.55	0.69	1.52	1.35	0.69	0.69	0.68	0.69	1.06	1.08	0.69	0.85	0.60	0.69	1.46	1.28	0.69
2013-14	1.59	1.10	1.49	1.17	1.10	0.66	1.69	0.64	0.56	0.9	0.64	0.56	0.59	0.64	0.90	1.47	1.09	1.32
2014-15	1.47	1.06	1.01	1.12	1.06	0.64	0.69	0.50	0.64	0.99	1.06	0.64	0.59	0.50	0.87	1.50	1.33	1.05
Mean	**1.24**	**0.71**	**0.92**	**1.18**	**0.67**	**0.34**	**0.44**	**0.31**	**0.51**	**0.80**	**0.58**	**0.68**	**0.68**	**0.27**	**0.72**	**1.39**	**0.71**	**0.96**

Appendix-II: Correlation Matrix of human and social capital variables with research productivity in Funded Research Projects

Var.	RP Score	TS	PS	PS/ TS	Ph.D.s	PN	TD1	TD2	TD3	TD4	TD5	TD6	PD1	PD2	PD3	PD4	PD5	PD6
RP score	1.00	0.64**	0.95**	0.86**	0.93**	0.95**	NS	NS	NS	NS	NS	NS	0.84**	0.73**	0.69**	0.73**	0.79**	0.85**
TS		1.00	0.73**	NS	0.61**	0.70**	0.43**	NS	0.74**	NS	0.48**	NS	0.67**	0.47**	0.79**	0.52**	0.80**	0.64**
PS			1.00	0.86**	0.96**	0.93**	NS	NS	0.45**	NS	NS	NS	0.87**	0.78**	0.79**	0.73**	0.84**	0.86**
PS/TS				1.00	0.91**	0.80**	NS	NS	NS	NS	NS	NS	0.77**	0.80**	0.55**	0.70**	0.59**	0.79**
Ph.D.s					1.00	0.91**	NS	NS	0.37*	NS	NS	NS	0.84**	0.79**	0.70**	0.76**	0.72**	0.85**
PN						1.00	NS	NS	0.44**	NS	NS	NS	0.85**	0.72**	0.67**	0.68**	0.78**	0.90**

Source: Computed based on the field data. TS: Team Size; PS: Performers Size; PN: Professional Networking
** Correlation significant at 1% level; * Correlation significant at 5% level; NS : Not Significant

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