



Faculty Research Productivity: Perspective from Human and Social Capital

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Abstract

This study analysed the influence of human and social capital on faculty research productivity. The speech and hearing institutions which offered a minimum of doctoral programme were selected for the study. The data set comprised 950 scientific articles published by 110 teaching faculty and 1068 scientific presentations made by 108 faculty. The influence of human capital was studied in terms of experience (years of teaching, clinical experience and years since Ph.D) and attributes (initiative and consistency). The results of simple linear regression revealed that among the human capital factors, consistency and initiative accounted for the highest variance and were also the key predictors. The influence of social capital was studied in terms of faculty-student collaboration and professional networking and it was found that both of them were significant predictors for scientific publications and scientific presentations. The inter correlations between the human capital variables and social capital variables revealed that initiative, consistency and faculty-student collaboration were positively and significantly correlated with years of clinical and teaching experience. Years since Ph.D were correlated with faculty-student collaboration for scientific presentations.

Keywords: Faculty Research Productivity, Human Capital, Social Capital, Speech And Hearing, Higher Education Institutions, Research Productivity

JEL Classification: I23, J24, D24

Paper Classification: Research Paper

Introduction

The defining element of higher education institutions, today, is research, which has become the gold standard when it comes to evaluation of higher education institutions. Research attainments are one of the most global academic functions having social and economic value. Rashtriya Uchatar Shiksha Abhiyan (RUSA), the National Higher Education Mission, a recent initiative of the Government of India also mandates Higher Education Institutions (HEIs) to focus more on the component of research (Ministry of Human Resource Development (MHRD), 2014).

An understanding of the factors influencing research productivity is of critical importance for administrators of Higher Education Institutions (HEIs), public or private. The inequality and large variance in research productivity is a management conundrum and one of the



greatest challenges confronting academic administrators. As observed by Abramo, Cicero and D'Angelo (2012), "Policymakers are ever more demanding of production efficiency in research activities, and this in turn has required and stimulated much analysis of the research production function." However, despite numerous studies encompassing a suite of variables, a clear picture on the factors influencing research productivity either at the individual or the institutional level remains elusive.

The productivity of scientific research has been studied applying the tenets of economic theory and using the production functions in economics (Adams & Griliches, 1996; 1998). From the perspective of economics, the term capital refers to a "factor of production used to create goods or services." (Boldizzoni, 2008). Human capital has been recognized as a factor of production and one of the key resources to conduct research, to realize research output (Johnes, 1988) and as "a fundamental source of economic productivity" (Romer, 1990). Human Capital is also seen to be "an investment that individuals make in themselves to increase their productivity" (Rosen, 1999).

In the analysis of knowledge creation, there has been a growing attention to the role played by collaborative efforts in scientific knowledge generation (Stephan & Levin, 1997). Collaborative effort through networking is a form of social capital. The concept of social capital, which was a "missing link in the theories of economic development" and productivity (Prakash & Selle, 2004; Karimzadeh, Ahmad & Karimzadeh, 2013) started emerging as an independent factor of production (Isham, Kelly & Ramaswamy, 2002).

Social Capital has been seen as significant in innovative processes, as it provided opportunities for focusing on unsolved needs and combining resources in novel ways (Burt, 1992; Gabbay & Leenders, 1999; Greve & Salaff, 2001). Previous studies revealed that social capital reinforced intellectual output in knowledge-intensive settings (Ahuja, 2000; Powell, Koput, Smith-Doerr & Owen-Smith, 1999).

Thus, in the quest to solve the productivity puzzle and to find out what drives productivity, the concepts of human capital and social capital as production elements gained ground and also got its due regard from the perspective of productivity at the individual (faculty), a department (unit) and at the institution (firm) levels. (Schultz, 1961; Black & Lynch, 1996; Fox & Milbourne, 1999; Sheffrin, 2003; Storberg-Walker, 2004; Huff, 2006; Frank & Bernanke, 2007; Marimuthu, Arokiasamy & Ismail, 2009; Crook, Todd, Combs, Woehr & Ketchen, 2011).

Human Capital-Defined

The human being is regarded as a knowledge delivery mechanism, into which inputs are added in the form of education and training, according to human capital theory (Bozeman, Rogers, Roessner, Klein & Park, 1999). The productive capacity of human beings in terms of knowledge and skills embedded in an individual (Schulz, 1961, Beach, 2009) is the basis of the production-oriented perspective of human capital. The Organisation for Economic Co-operation and Development (OECD) (2001) has defined human capital as "the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being." Rastogi (2002) amplified this point of view and conceptualised human capital to include knowledge, competency, attitude and behaviour embedded in an individual. Frank and Bernanke (2007) defined human capital as "an amalgam of factors such as education, experience, training, intelligence, energy, work habits, trustworthiness and initiative that affect the value of a worker's marginal product.

Rodriguez and Loomis (2007) added the social perspective alongside the stock of knowledge, skills, competencies and attributes embodied in an individual. According to Greve, Benassi and Sti, (2004), the positive attributes, an individual possessed represented an asset both at individual as well as at the organisation level.

Human Capital can, therefore, be taken to signify the measure of the economic value of education (qualification), competencies and skills (tangible and intangible), knowledge (including the learning derived from experience), and attributes embodied in individuals which results in a stock of productive capital.

Social Capital-Defined

Social capital refers to “connections and relationships among individuals in the form of networks and the norms of reciprocity and trustworthiness that arise out of mutual acquaintance and recognition” (Putnam, (n.d.)). Woolcock and Narayan (2000) defined social capital as “the norms and networks that enable people to act collectively”. The OECD defined social capital as “networks together with shared norms, values and understandings that facilitate co-operation within or among groups. Values may change yet they are valuable always.” (OECD, n.d.). Social Capital was seen as the glue that held the individuals and the units together. It was understood that the networks that constituted social capital served as conduits for the flow of helpful information that facilitated achievements of common purpose goals.

Social capital has been perceived widely in terms of networks, norms and trust, and the way it enabled institutions to be more efficient in accomplishing common objectives. The two main players in knowledge generation in a Higher Education Institution are the faculty and the students. Social capital has been understood as contributions from individuals with whom one interacts at the workplace and during problem-solving (Burt, 1992; Coleman, 1988; Lin, 2001). These included relationships between groups as well as within groups.

Research Gap and Contribution of the Study

Despite the importance of human and social capital, there have been very few studies that have explored the influence of human and social capital on productivity, especially, research productivity. It is against this background, 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 would contribute to the literature of research productivity studies and has useful takeaways to the policy makers and academic administrators.

Objective of the Study

The objective of the study included study of the influence of human and social capitals on faculty research productivity.

Hypotheses

The following null hypotheses were formulated.

H₀1: There is no association between human capital (experience and attributes) and faculty research productivity.

H₀2: There is no association between social capital and faculty research productivity.

Research Methodology

Research Design

The study was analytical in nature and the speech and hearing institutions which offered a minimum of doctoral programme were selected for the study. The information on scientific publications, scientific presentations and the demographic data were gathered from (i) the institutional website, (ii) the annual reports of the institutions, (iii) mailed questionnaire. While collecting the data, the scientific publications of teaching faculty in the core departments of speech, language and hearing sciences alone were reckoned. Publications in symposium/conference proceedings were included. While reckoning the research productivity for this purpose, a research productive unit was taken to mean the researcher's contribution in their capacity as first author / last author, any other author by-line position in scientific publications and scientific presentations. The data on scientific publications were collected from 2008-09 to 2014-15 and the data on scientific presentations were collected from 2009-10 to 2014-15 in the selected institutions. The data set comprised 950 scientific articles published by 110 teaching faculty and 1068 scientific presentations made by 108 faculty.

Computation of Research Productivity Scores

With a view to accord differential weightages and to arrive at research performance scores, 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.

Publications in international journals, national journals and conference proceedings were given a score of 5, 3 and 2 respectively. Presentation in international conferences was given a score of 5 and presentation in national conferences was given a score of 3.

Metrics for Human Capital

For the purposes of this study, the term human capital was operationalised to include 'experience' in terms of years of teaching experience, years of clinical experience and years since Ph.D and 'attributes' in terms of initiative and consistency. Initiative was reckoned in terms of previous publications/previous presentations. Consistency was calculated in terms of the number of years a faculty was consistent in producing a scientific publication or making a scientific presentation during the reference period.

Metrics for Social Capital

For the purposes of this study, the term social capital was operationalised to include faculty-student collaboration and professional networking among the faculty. Faculty-student collaboration was reckoned in terms of the number of times a faculty had collaborated with the students in their productivity with respect to scientific publications and presentations. Similarly, 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 with respect to scientific publications and presentations.

Data Analysis

Statistical analysis was done using the software Statistical Package for Social Sciences (SPSS), version 20.0. Descriptive statistics was done to compute the mean, standard deviation (SD) and

median. Test for normality was negative and therefore, non-parametric tests were performed using the SPSS software.

Results and Discussion

The influence of human and social capital on faculty research productivity was studied applying Spearman rank correlation and simple linear regression. The correlation results are presented in Tables 1 and 2.

Table 1: Faculty Research Productivity and Scientific Publications: Spearman Rank Correlation

	RP Score	YCE	YTE	YSP	Initiative	Consistency	FSC	PN
RP Score	1.000	0.460**	0.389**	NS	0.911**	0.856**	0.784**	0.859**
YCE		1.000	0.881**	0.813**	0.463**	0.453**	0.410**	0.278**
YTE			1.000	0.692**	0.390**	0.381**	0.309**	0.271**
YSP				1.000	NS	NS	NS	NS
Initiative					1.000	0.950**	0.823**	0.772**
Consistency						1.000	0.759**	0.731**

Source: Computed based on the field data.

Note: YCE: Years of Clinical Experience; YTE: Years of Teaching Experience; YSP: Years since PhD; FSC: Faculty-Student Collaboration; PN: Professional Networking.

** Correlation significant at 1 per cent level; * Correlation significant at 5 per cent level; NS: Not Significant.

Table 2: Faculty Research Productivity and Scientific Presentations: Spearman Rank Correlation

	RP Score	YCE	YTE	YSP	Initiative	Consistency	FSC	PN
RP Score	1.000	0.364**	0.331**	0.310*	0.924**	0.776**	0.798**	0.712**
YCE		1.000	0.914**	0.835**	0.307**	0.387**	0.300**	NS
YTE			1.000	0.760**	0.264**	0.317**	0.245*	NS
YSP				1.000	NS	NS	0.338*	NS
Initiative					1.000	0.840**	0.743**	0.662**
Consistency						1,000	0.569**	0.512**

Source: Computed based on the field data.

Note: YCE: Years of Clinical Experience; YTE: Years of Teaching Experience; YSP: Years since PhD; FSC: Faculty-Student Collaboration; PN: Professional Networking.

** Correlation significant at 1 per cent level; * Correlation significant at 5 per cent level; NS: Not Significant.

Years of Clinical Experience (YCE) and Faculty Research Productivity

A positive correlation was observed between YCE and faculty research productivity with the strength of association ranging between low and moderate. It was also statistically significant at 1 per cent level for both scientific publications and scientific presentations indicating a nexus between clinical experience and research productivity. Among the experience variables, clinical experience had higher correlation than teaching experience.

Years of Teaching Experience (YTE) and Faculty Research Productivity

YTE correlated positively with faculty research productivity for both scientific publications and scientific presentations. The correlation was statistically significant, but

low. The finding lends validity to the widely held view of the nexus between teaching and research.

Years since Ph.D (YSP) and Faculty Research Productivity

No correlation between YSP and faculty research productivity was evident in respect of scientific publications. However, YSP had a positive and statistically significant correlation with scientific presentations and had higher correlation than years of teaching experience.

Initiative and Faculty Research Productivity

A significant positive high correlation between initiative and faculty research productivity (scientific publications and scientific presentations) was noticed.

Consistency and Faculty Research Productivity

The correlation between consistency and faculty research productivity was significantly positive and high for scientific publications and scientific presentations.

Faculty-Student Collaboration and Faculty Research Productivity

Faculty-student collaboration had significantly positive and high correlation with faculty research productivity for scientific publications and scientific presentations.

Professional Networking and Faculty Research Productivity

The correlation between professional networking and faculty research productivity was positive and high for scientific publications and scientific presentations. It was also statistically significant.

Inter-Correlations between the Human Capital and Social Capital Factors

The inter-correlations between human capital and social capital variables revealed that years of clinical and teaching experience had significant correlations with initiative, consistency and faculty-student collaboration for scientific publications and scientific presentations. Years since Ph.D were correlated only with faculty-student collaboration for scientific presentations. The strength of correlation ranged from weak to moderate.

Results of Regression Analysis

The results of simple linear regression coefficients are given in Tables 3 and 4. The regression revealed that among the human capital factors, consistency and initiative accounted for the highest variance and were also the key predictors with respect to publication productivity and productivity in scientific presentations. (See Table 3 and 4)

Among the social capital factors, both faculty-student collaboration and professional networking were significant predictors for scientific publications and scientific presentations. The variance in research productivity explained by faculty-student collaboration was about 50 percent for both publications and presentations. Professional networking accounted for about 48 percent variance in publications productivity and about 33 percent variance in productivity of scientific presentations. (See Tables 3 and 4).

Table 3: Faculty Research Productivity and Scientific Publications: Simple Linear Regression

	R ²	Standardized Coefficient (β)	t	Sig.	Unstandardized Coefficient (B)	Lower bound	Upper bound	F	Sig.
YCE	0.188	0.433	4.970	0.000	0.052	0.031	0.072	24.706	0.000
YTE	0.129	0.359	3.977	0.000	0.045	0.022	0.067	15.819	0.000
Initiative	0.611	0.781	12.951	0.000	0.088	0.075	0.102	167.723	0.000
Consistency	0.707	0.841	16.058	0.000	0.460	0.403	0.516	257.858	0.000
FSC	0.499	0.706	10.323	0.000	0.102	0.082	0.121	106.561	0.000
PN	0.484	0.696	10.020	0.000	0.092	0.074	0.110	100.392	0.000

Source: Computed based on the field data.

Note: YCE: Years of Clinical Experience; YTE: Years of Teaching Experience; YSP: Years since PhD; FSC: Faculty-Student Collaboration; PN: Professional Networking.

Table 4: Faculty Research Productivity and Scientific Presentations: Simple Linear Regression

	R ²	Standardized Coefficient (β)	t	Sig.	Unstandardized Coefficient (B)	Lower bound	Upper Bound	F	Sig.
YCE	0.113	0.336	3.667	0.000	0.038	0.018	0.059	13.447	0.000
YTE	0.081	0.285	3.067	0.003	0.036	0.013	0.059	9.404	0.003
YSP	0.092	0.304	2.016	0.051	0.037	0.000	0.075	4.065	0.051
Initiative	0.618	0.786	13.089	0.000	0.093	0.079	0.108	171.319	0.000
Consistency	0.611	0.782	12.837	0.000	0.512	0.433	0.591	164.776	0.000
FSC	0.485	0.696	9.991	0.000	0.097	0.077	0.116	99.814	0.000
PN	0.334	0.578	7.285	0.000	0.074	0.054	0.094	53.065	0.000

Source: Computed based on the field data.

Note: YCE: Years of Clinical Experience; YTE: Years of Teaching Experience; YSP: Years since PhD; FSC: Faculty-Student Collaboration; PN: Professional Networking.

Human capital theory is founded on the tenet that the 'individual researchers' are the key resources who are chiefly responsible for the overall output. However, it is witnessed that not all researchers produce the same quantity and quality of research output, leading to variances in the research productivity among individual faculty. One plausible explanation for the differences in individual research productivity could be offered in terms of the differences in the levels of 'experience' and the levels of certain pro-research personal 'attributes'. (Paul, Vijayaragavan, Singh, Burman & Chahal, 2017). This explanation derives its strength from the fact that experience is seen as an index of individual endowments of human capital and has been used as a measure of human capital in productivity studies (Iglıc, Doreian, Kronegger & Ferligoj, 2017). Further, a researcher is expected to have internal drive and initiative, which is a reflection of an individual's self-reliance and persistence. They are not only desirable but also essential for achieving high levels of research productivity. (Greene, 1969).

The findings of the study on the nexus between clinical experience and faculty research productivity is consistent with the findings of Fukuzawa (2013), who had reported that the experience and knowledge obtained by a practical physician had a statistically significant and positive relationship with research productivity, especially, in terms of the number of research papers.

The positive correlation between years of teaching experience and research productivity is also consistent with the findings that teaching and research are mutually supporting, if not inseparable (Webster, 1985) and the contention that there is a symbiotic relationship between teaching and research (Neumann, 1992; Marsh & Hattie, 2002). Studies investigating the influence of experience and research productivity had revealed that the number of years of experience is a significant predictor of research productivity of academics (Jung, 2012). Edem and Atinmo (1995) had observed that years of experience with respect to academic writing and scientific publication improved with time. It is reported that work experience had a positive influence on the publication output.

Based on the responses from Indian academics, Babu and Singh (1998) had indicated that vast research experience and acquaintance with varied research practice characterized productive researchers. The assertion that "Experience is the best teacher" seems to be valid in the context of faculty research productivity. The finding of YCE having relatively higher correlation with faculty research productivity than YTE, in both scientific publications and presentations is perhaps, due to the fact that the discipline of speech and hearing is largely clinical with rehabilitation focus.

The findings of the present study on initiative and consistency, which showed a significant positive correlation to faculty research productivity, also draw support from the previous studies. Among the personal attributes, 'initiative' and 'consistency' were found to be a significant factor influencing research productivity (Babu & Singh, 1998). Individuals who possessed a high degree of initiative and self-reliance were reported to be more creative and productive among the scientists. (Chambers, 1964; Balderston, 1964).

Further, according to Behaviour Consistency theory, past productivity is the best predictor of future productivity (Wernimont & Campbell, 1968). As explained by Mael (1991), an individual's previous success at performing a task enhances his or her skill level and self-efficacy in that domain, increasing both the desirability of pursuing and the probability of ultimately repeating that behaviour. Accordingly, previous research productivity, be it in the form of scientific publication or a scientific presentation may be construed as a better indicator about possessing of research attributes and it can be said that they would continue to be productive in future. (Park & Gordon, 1996; Rodgers & Maranto, 1989; Williamson & Cable, 2003). It is also perceived that success in publishing breeds the expectation of continued success (Fogarty, 2004).

The findings of the current study on faculty-student collaboration and professional networking are in consonance with the findings of Kamesh (2010) who explained that "collaboration is an aspect of the local construction of knowledge. Such a process is considered endogenous to knowledge production and driven by knowledge interests".

Further, the students' role in universities has also changed, making these students not only the recipients of existing knowledge but also active participants in knowledge generation. In recent years, students' participation is an essential factor for carrying out academic research in universities and for diffusion of tacit knowledge in innovation system (Patra & Krishna, 2015).

The increased partnership between faculty and the student is an encouraging trend and has many advantages (Ramkumar, Savithri & Narayanasamy, 2017). First, collaboration is a crucial mechanism for mentoring graduate students and postdoctoral researchers (Bozeman & Corley, 2004). Second, participation in scientific publications and scientific presentations provides a golden opportunity to 'socialise' students into the profession (McKinney, Jarvis,

Creasey, Herrmann, 2010). Third, it enhances students' research skills (Kardash, 2000). Fourth, it establishes positive mentoring relationships (Cox, Mcintosh, Terenzini, Reason, & Lutovsky Quaye, 2010). Fifth, it provides 'extra-classroom' communication/interaction with professors (Ryser, Halseth & Thien, 2009). Finally, it helps students to understand the disciplinary nuances of research.

Graduate students have been argued to play the most critical role in university research output and having more students in master programs or PhD. programs is positively correlated with professors' productivity (Berelson, 1960; Hagstrom, 1971; Ryu & Pae, 1997; Salter et al 2000; Melin, 2000). An interview among 51 scientists carried out by Fonseca, Velloso, Wofchuk, & de Meis (1997) to identify factors that influence their productivity revealed that the majority of respondents felt that students did influence their productivity.

A survey conducted by Gemme and Gingras (2008) revealed that a little over 80 percent of students had contributed to at least one publication during their graduation. Further, 55 percent of students had contributed to at least one conference paper and 39 percent to at least one poster, signifying that the students indeed contribute substantially to research productivity in academic institutions.

Another reason for the encouraging trend in faculty-student collaboration in the discipline could be attributed to the course requirements of the masters and doctoral programme which insists on completion of a dissertation at master's level and publication of scientific articles in peer-reviewed journals at the doctoral level. Further, the role of the faculty seems to have changed from a 'sage on the stage' to that of a 'guide by the side' in higher education. Student-centric approach has caught up in higher education and teachers' role is defined to be a facilitator with a responsibility to create an enabling environment for better learning, to empower the student to develop higher-order cognitive skills involving analysis, synthesis, evaluation and creation of knowledge (Ramesh, 2016).

Further, networking is the new form of academic research from scientific collaboration. This is propelled by the fact that there is a shift in research from an "individualistic, disciplinary-based and place-bound ideal towards a collective, problem-oriented and multi-organizational activity" (Kamesh, 2010). This, is based on an assumption that the production and consumption of knowledge happens at the same time in academic disciplines through multiple interactions as mentioned in the 'Triple Helix' or 'Mode2' by Etzkowitz and Leydesdorff (2000) and Gibbons et al. (1994).

Summary of Test of Hypotheses

H_01 that there is no association between human capital (experience and attributes) and faculty research productivity with respect to years of teaching experience, years of clinical experience and the attributes of initiative and consistency was rejected for scientific publications as well as scientific presentations. H_01 was also rejected with respect to years since Ph.D in the case of scientific presentations. However, in the case of scientific publications, H_01 was accepted with respect to years since Ph.D.

H_02 that there is no association between social capital and faculty research productivity was rejected for scientific publications as well as scientific presentations.

The results of the tests of hypotheses indicated that human and social capital influence faculty research productivity for scientific publications and presentations.

Conclusion

An understanding of the factors influencing faculty research productivity is of critical importance not only to the policymakers and academic administrators but also to the researching community. Despite the importance of human and social capital, there have been very few studies that have explored their influence on research productivity in Indian context. This study makes a modest attempt to gain an understanding of the influence of human and social capital on faculty research productivity. This is also a pioneering study covering the discipline of speech, language and hearing sciences which comes under the allied health category. Although the dataset of this study belonged to a single discipline, the findings of this study can be useful and relevant to the literature of research productivity studies and has useful takeaways to the policy makers and academic administrators. The problem of availability of a reliable and updated database persists and is a serious limitation, especially when conducting such studies on productivity. This methodological issue in getting complete information on the scientific publications and scientific presentations needs to be addressed. India needs to move towards having a reliable and updated database, discipline-wise and institution-wise such as Current Research Information System in Norway (Cristin). A large scale study of human and social capital factors at the national level across various disciplines is desirable and is recommended.

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