

Research Output Analysis of Science and Technology Faculty Members of Mizoram University

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Abstract

The study analyzed the research output of Science and Technology faculty members of Mizoram University. The survey conducted for 99 faculty members of 17 academic departments of S&T belongs to 5 schools of studies under Mizoram University. The study framed to examine the socio-demographic characteristics of faculty members along with trend and growth of research output, forms of research output as well as inhibitors to faculty members on their research activities. The study concluded with suggestions to improve upon the basic infrastructures to boost up the research output of the university.

Keywords: Research Output, Research Productivity, Faculty Research Output, Science and Technology, Mizoram University.

1. Introduction

The current higher education scenario of the country like India is not supportive to sustainable research and development. Indian higher education system is facing a crucial problem in cutting edge research. Indian universities and colleges have been forced to fulfill the demands of government in terms of UG and PG students' enrollment despite having bad physical infrastructure, degree allotment based curriculum, lack of well qualified teaching as well as supportive staff, and decreasing financial support for the development of colleges and universities. There is dire need to reform the basic physical infrastructure of universities and colleges to increase the research and innovation in present dynamics. Faculties and other supportive research staff should be motivated enough to raise their level of research output in terms of innovation. This may lead to the higher education system in the next level where linkages with the other parts of the world will increase in terms of research collaboration, knowledge sharing, increased research output as well as increased quality of research. The current problems related to Indian higher education system prompts to undertake a research to find out the research output of faculty members in the present scenario. There are number of scientometric studies conducted to access the research output of various departments, institutions, universities and faculty members individually. To know the factors affecting research output of the faculties of universities and colleges are at greater interest as well as the ways they retain their level among the academic community in current scenario.

2. Review of Literature

Cele et al. (2014) studied various factors contributing to the level of research output at the Durban University of Technology (DUT) and found reveals that majority of respondents indicate various factors, including individual and institutional elements, as the main barrier to participate in doing research. Kipchirchir (2014) examined the influence of PG students' personal characteristics on their research output and concluded low research output due to poor attitude and lack of interest in research. Roleda et al. (2014) measured the research productivity of academic departments at De La Salle University (DLSU) using Scopus database and found that research productivity output includes journal publications, conference papers, books, and monographs. Sweileh et al. (2014) assessed the scientific research productivity of the An-Najah National University, Palestine based on Scopus database and found steady growth in research output of university over the years. Bay et al. (2013) investigated the low research productivity due to lack of research methodology skills. Okiki (2013) assessed the high level of research productivity in journal publications, technical reports, conference papers, working papers, and occasional papers but low Internet bandwidth and financial constraint are the barriers to research productivity. Aswathy & Gopikuttan (2013) analyzed the non-significant difference between the experience and productivity but found the increase in age and experience results in more collaboration. Jung (2012) explored the individual and institutional factors that contribute to research productivity as well as compared determinants across academic disciplines and found highly internationalized research activities which are influenced by personal characteristics, workload, differences in research styles, and institutional characteristics. Chen et al. (2010) examined research productivity as well as intrinsic and extrinsic motivators to conduct research. Lertputtarak (2008) investigated the factors related to research productivity. Rodgers & Neri (2007) investigated the reason behind more research productivity of economics departments in Australian universities than others. Bland et al. (2005) conducted a study on the theoretical, practical, and predictive model of faculty and department research productivity and found that numerous characteristics impact faculty research productivity.

Iqbal & Mahmood (2011) studied factors related to low research productivity at higher education level and concluded that extra teaching load, performance of administrative duties along with academic duties, lack of funds, non-existence of research leave, negative attitude of the faculty towards research, lack of research skills, non-availability of latest books, absence of professional journals, less number of university own journals, are the major causes of low productivity and reduced the research productivity of the university faculty members. Levin & Stephan (1991) analyzed the relationship between age and publishing productivity of Ph.D. scientists and found that scientific productivity is not investment-motivated as well as an expectation that the latest educated were the most productive was not generally supported by the data. Banal-Estanol et al. (2013) studied university projects and research collaboration projects with industry and found that universities focus on more basic ventures when they develop projects alone and that the collaboration with firms increases the quantity and quality of the research output only when the firms' characteristics make them valuable partners. Williams (2010) measured the research output of newer Australian universities based on Thomson Reuters ISI and Scopus databases and found that there had been some convergence in research publications with the newer universities catching up on the traditional research-intensive universities. Abbott & Doucouliagos (2004) explored the links between research output, research income, academic, and non-academic labor and concluded that research income, academic staff, and post-graduates were all positively associated with research output. Hirsch (2005) made an effort to quantify an individual's scientific research output and

finally proposed *h-index*, defined as the number of papers with citation number higher or equal to *h* as a useful index to characterize the scientific output of a researcher.

3. Scope of Study

The study is confined to Science & Technology faculty members of Mizoram University, Aizawl. The number of Science & Technology departments covered under study is given in Table - 1. There are 99 faculty members belongs to 17 Science & Technology departments under 5 Schools of studies under Mizoram University. Further faculty members research output will be measured from 2009-2014 academic years.

4. Objectives of the Study

The objectives of the study are as follows:

- a) Examine the socio-demographic characteristics of faculty members.
- b) Find out the trend and growth of research output of faculty members.
- c) Find out the forms of research output of the faculty members.
- d) Find out the inhibitors to faculty members on their research activities.

5. Research Methodology

The study was designed to investigate the research output of Science & Technology faculty members of Mizoram University. The population for the study was all faculty members belong to Science & Technology departments. The survey was conducted through a well-structured questionnaire distributed among 99 faculty members of the Science & Technology departments of the university to obtain relevant data. Out of 99, a total number of 80 (80.8%) faculty members responded to the questionnaire. The collected data were analyzed, tabulated, interpreted to draw the inferences.

6. Research Analysis

a) Response Ratio

There were 99 faculty members representing 17 academic departments under 5 schools of studies at Mizoram University at the time of data collection. The responses of the faculties were arranged according to school & department wise respectively shown in table - 1.

Table - 1: Number of Faculties in Schools and Departments

Name of the School	Name of the Department	No. of Faculty Members		Response Percentage
		Distributed	Responded	
School of Life Sciences (SLS)	Botany	7	7	100%
	Zoology	8	7	87.5%
	Biotechnology	6	4	66.67%
School of Physical Sciences (SPS)	Physics	7	6	85.71%
	Chemistry	7	6	85.71%
	Mathematics & Computer Science	5	4	80%
School of Earth Sciences & Natural Resources Management	Geology	6	5	83.33%
	Forestry	8	6	75%
	Environmental Sciences	8	4	50%
	Geography & NRM	8	8	100%

(SES&NRM)	HAMP	6	5	83.33%
School of Engineering & Technology (SET)	Information Technology	5	4	80%
	Computer Engineering	4	2	50%
	Electrical Engineering	4	3	75%
	Electronics & Comm. Engineering	5	4	80%
	Civil Engineering	3	3	100%
School of Fine Arts, Architecture & Fashion Technology (SFAAFT)	Planning & Architecture	2	2	100%
Total		99	80	80.8%

Table - 2: School wise Response Ratio

Name of the School					
	SLS	SPS	SES&NRM	SET	SFAAFT
Questionnaire Distributed	21	19	36	21	2
Questionnaire Responded	18	16	28	16	2
Response Ratio	85.71%	84.21%	77.78%	76.19%	100%

Table - 1 & table - 2 revealed the department as well as the school-wise response of faculty members to the questionnaires distributed to them. There were 80.8% faculties responded to the questionnaires distributed to them which become the average response rate for the questionnaires. The highest response rate (100%) came from Botany, Geography & Natural Resources Management, Civil Engineering, and Planning & Architecture departments amongst 17 Science & Technology departments of the university. The least response (50%) received from two departments Environmental Sciences and Computer Engineering. Amongst 5 schools of studies, SFAAFT had the highest response rate (100%) followed by SLS (85.71%), SPS (84.21%), SES&NRM (77.78%), and SET (76.19%). Some faculty members were absent for a longer period of time for their academic assignments during the study period, so could not respond the questionnaires that made their departments' response rate down.

b) Gender & Age of Respondents

Table - 3: Gender & Age of Respondents – Cross Tabulation

Gender of the respondent		Age of the respondent (Age group)				Total	Percentage
		<30	31-40	41-50	>51		
Male	Male	9	28	16	11	64	80%
	Female	6	10	0	0	16	20%
Total		15	38	16	11	80	100%
Percentage		18.75%	47.50%	20%	13.75%	100%	

Table - 3 represents the gender and age of the respondents. From the observation of Table - 3, there were 80% male respondents and 20% female respondents. The age group has been divided into 4 categories viz. less than 30, 31-40, 41-50, and more than 50. There were 47.5% respondents belongs to 31-40 age group while 18.75% respondents belong to less than 30 age group. There are 20% respondents comes under 41-50 age group whether 13.75% respondents comes under more than 50 age group. Further, 66.25% respondents come under

the age of 40 years which shows that majority of the responses received from young faculty members. In another way, we can say that the majority of the faculty members of the Science & Technology departments are younger in age. Interestingly, all the female faculty members are young and they all belong to less than 30 and 31-40 age groups only.

c) Academic Position & Age of Respondents

Analysis of the Academic Position and Age of Respondents of faculty members has been discussed in table - 4. It reveals that 73.75% faculty members belong to Assistant Professor category followed by 21.25% Professors while Associate Professors were 5% only. Further 18.75% belong to age group less than 30 which included 100% Assistant Professors; 47.5% belong to age group 31-40 which included 95% Assistant Professors while Associate Professors and Professors were only 5%; 20% belong to 41-50 age group which included 43.75% Assistant Professors and rest were Associate Professors and Professors; 13.75% belong to more than 50 age group which included 9% Assistant Professor while 91% were Professors. There was a lack of Associate Professors at this level. Based on this analysis, it is observed that up to 40 years of age group Assistant Professors are more in number and as age is increasing Professors and Associate Professors are increasing. Thus we can say that for reaching higher academic position age is the decisive factor.

Table - 4: Academic Position & Age of Respondents

Academic Position	Age of the respondent				Total	Percentage
	<30	31-40	41-50	>51		
Assistant Professor	15	36	7	1	59	73.75%
Associate Professor	0	1	3	0	4	5%
Professor	0	1	6	10	17	21.25%
Total	15	38	16	11	80	100%
Percentage	18.75%	47.50%	20%	13.75%	100%	

d) Academic Position vis-a-vis Academic Qualification

Analysis of responses by Academic Position vis-à-vis Academic Qualification of the faculty members covered under study has been discussed in table - 5.

Table - 5: Academic Position vis-à-vis Academic Qualification

Academic Position	Academic Qualifications				Total	Percentage
	Ph. D	M. Phil	Master Degree	Others		
Assistant Professor	33	4	22	0	59	73.75%
Associate Professor	4	0	0	0	4	5%
Professor	16	0	0	1	17	21.25%
Total	53	4	22	1	80	100%
Percentage	66.25%	5%	27.5%	1.25%	100%	

On the observation of table - 5, it has been found that 66.25% faculty members had Ph. D. degree as their highest academic qualification while 5% were M. Phil. There were 27.5% faculty members of Science & Technology departments had a Masters degree (M.Sc./M. Tech.) as the highest academic qualification while 1.25% had some other degree (like D.

Litt.) also. Amongst the Ph. D. degree holders, 62% belong to Assistant Professor and 30% belong to Professor while 8% belong to Associate Professor. All the M. Phil. and Masters Degree holders belong to Assistant Professor. Horizontally in the category of Assistant Professor, 56% has Ph. D. Degree, 37% Masters Degree and 7% have M. Phil. Degree. Horizontally in the category of Associate Professor, all have Ph. D. Degree while in the case of Professors, 94% has Ph. D. degree and 6% have the higher degree (D. Litt.) than Ph. D.

e) Academic Position vis-a-vis Teaching Experience

Analysis of the Academic Position vis-à-vis Teaching Experience of faculty members has been discussed in table - 6. On the observation of table - 6, it has been found that 41.25% faculties belong to Assistant Professor and has experience of 1-5 years in their career while 30% faculties belong to Assistant Professor and Associate Professor have the experience of 6-10 years. There are 12.5% faculties have experience of 11-15 years out of which 30% are Assistant Professor, 20% faculties are Associate Professor, and 50% are Professor. There are 3.75% faculties has experience of 16-20 years and belong to Professor whereas 5% faculties have 21-25 years of experience and out of them 75% are Professor and 25% are Associate Professor. In the group of 26-30 years experience and more than 31 years experience, there are 3.75% faculties in each group which belong to Professor only.

Table - 6: Academic Position vis-a-vis Teaching Experience

Academic Position	Teaching Experience (in years)							Total	Percentage
	1-5	6-10	11-15	16-20	21-25	26-30	>31		
Assistant Professor	33	23	3	0	0	0	0	59	73.75%
Associate Professor	0	1	2	0	1	0	0	4	5%
Professor	0	0	5	3	3	3	3	17	21.25%
Total	33	24	10	3	4	3	3	80	100%
Percentage	41.25%	30%	12.50%	3.75%	5%	3.75%	3.75%	100%	

f) Academic Position vis-à-vis Publications (July 2009 – June 2014)

The analysis of the Academic Position vis-à-vis Publications of faculty members has been discussed in table - 7.

Table - 7: Academic Position vis-à-vis Publications (July 2009 – June 2014)

Academic Position	Publications (in number)					Total	Percentage
	None	1-10	11-20	21-30	>30		
Assistant Professor	7	40	9	3	0	59	73.75%
Associate Professor	0	2	1	1	0	4	5%
Professor	0	3	5	6	3	17	21.25%
Total	7	45	15	10	3	80	100%
Percentage	8.75%	56.25%	18.75%	12.50%	3.75%	100%	

Designation and experience had the direct relationship with the academic growth of faculty. In this regard, it has been found that 8.75% faculties have no publication, during five years of range taken for study, belong to entry-level i.e. Assistant Professor. There are 56.25%

faculties have total publications range from 1-10 in last five academic years i.e. July 2009 – June 2014, out of which 89% belong to Assistant Professor and rests belong to Associate Professor and Professor. About 18.75% faculties have publications range from 11-20, out of which 60% faculties are Assistant Professor, 33% faculties are Professor and rests are Associate Professor. There are 12.5% faculties have publications range from 21-30, out of which 30% faculties are Assistant Professor, 10% faculties are Associate Professor, and 60% faculties are Professor. About 3.75% faculties have publication range more than 30 belong to Professor. Further, 75% faculties have publication range from 1-20 and most of them belong to Assistant Professor. Out of total Assistant Professor, 68% faculties have publication range from 1-10 whereas in Professors, 53% faculties have more than 20 publications.

g) Teaching Experience vis-à-vis Publications (July 2009 – June 2014)

Analysis of the number of publications vis-à-vis teaching experience by the faculty members during 2009-2014 has been discussed in table - 8. It reveals that out of 80 faculty members, 41.25% have 1-5 years of teaching experience, 30% have 6-10 years of teaching experience, 12.5% have 11-15 years of teaching experience, 3.75% have 16-20 years of teaching experience, 5% have 21-25 years of teaching experience, 3.75% have 26-30 years of teaching experience and it is worth mentioning that 3.75% have more than 31 years of teaching experience. Further, on the vertical analysis of table - 8, it has been observed that 8.75% have no publication during 5 years of time while the majority of the faculty members (56.25%) have 1-10 publications. There are 18.75% faculties have 11-20 publications during the period whereas 12.5% have 21-30 publications. More than 30 publications have been reported by 3.75% faculties having experience of 16-25 years. On the cross-analysis of table - 8, it has been found that as experience increases the number of productive faculties decreases, thus reduction in the total number of publications.

Table - 8: Teaching Experience vis-à-vis Publications

Teaching Experience (in Years)	Publications (between July 2009 – June 2014)					Total	Percentage
	None	1-10	11-20	21-30	> 30		
1-5	5	24	4	0	0	33	41.25%
6-10	2	16	4	2	0	24	30%
11-15	0	3	3	4	0	10	12.50%
16-20	0	0	1	1	1	3	3.75%
21-25	0	0	1	1	2	4	5%
26-30	0	1	1	1	0	3	3.75%
>31	0	1	1	1	0	3	3.75%
Total	7	45	15	10	3	80	100%
Percentage	8.75%	56.25%	18.75%	12.50%	3.75%	100%	

h) Preferred Medium of Research Publications

Analysis of the preferred medium of research publications during July 2009 – June 2014 has been discussed in table - 9. It reveals that 87.5% faculties preferred articles published in the form of Journal followed by Conference papers (48.75%) and Book chapters (21.25%). There are 2.5% faculties who preferred Text-book as a medium of their research publication while 1.25% has published in the form of the Technical report. None of the faculties have co-authored books as a publication medium. About 2.5% faculties have some other means of publications.

Table - 9: Preferred Medium of Research Publication

Publication Type/ Medium	Frequency	Percentage
Text books	2	2.5%
Book chapters	17	21.25%
Co-authored books	0	0.0%
Journal articles	70	87.5%
Technical reports	1	1.25%
Conference papers	39	48.75%
Others	2	2.5%

i) Total Number of Publications and Publication Media (Year wise breakup)

Analysis of the total published items in the various publications media (year-wise breakup) has been discussed in table - 10. It has been observed that faculties have published their most of the research output in the form of Journal articles followed by Conference proceedings and Chapters in books. There is research output published in the form of Abstracts (12), Reviews (3), Editorials (2), and Others (9). News items and Patents have not been published during the last five academic years. Further, it has been noted that Journal articles and Book chapters have shown tremendous growth during the period while publication as Conference papers has shown fluctuations year-wise but still second most published medium.

Table - 10: Total Number of Publications in Publication Mediums (Year wise)

SN	Publication Media	2009-10	2010-11	2011-12	2012-13	2013-14	Total
1	Journal articles	94	102	113	119	172	600
2	Abstracts	2	1	2	6	1	12
3	Reviews	0	0	1	1	1	3
4	Editorials	0	0	2	0	0	2
5	Chapters in book	7	6	13	21	26	73
6	Conference proceedings	27	33	27	40	27	154
7	News items	0	0	0	0	0	0
8	Patents	0	0	0	0	0	0
9	Others	4	0	2	2	1	9
	Total	134	142	160	189	228	853

j) Distribution of Authorship Pattern

Table - 11 display authorship patterns of faculty members of Science and Technology departments comparing years 2009-10 to 2013-14. The comparison of growth patterns from year 2009-10 to 2013-14 is clearly given in table – 11.

Table - 11: Distribution of Authorship Pattern

SN	Authorship Patterns	2009-10	2010-11	2011-12	2012-13	2013-14	Growth
1	Single Author	18	19	16	29	40	222.2%
2	Two Authors	27	39	59	43	59	218.5%
3	Three Authors	24	25	34	47	44	183.3%
4	Four Authors	22	13	12	17	43	195.4%
5	Five Authors	13	15	9	6	14	107.7%
6	More than 5 Authors	5	14	8	13	5	100.0%
	Total	109	125	138	155	205	

From the analysis of table - 11, it has been observed that two authorship pattern has shown tremendous growth (218.5%) among faculties of Science & Technology. The three authorship pattern has shown 183.3% growth during the period. The single authorship pattern has shown tremendous (222.2%) growth among faculties. The four authorship pattern has shown 195.4% growth during the period while five authorship pattern has not shown significant growth during the period. More than five authorship pattern also existed with no growth during the study period. From the analysis of table - 11, it has been found that single authorship pattern is most prevalent amongst faculties followed by two authorship pattern, four authorship pattern and three authorship pattern.

k) Research Output in Impact Factor Journals (July 2009 - June 2014)

Analysis of the number of research output published in Impact Factor (IF) journals during the period of 2009-2014 has been discussed in table - 12.

Table - 12: Research Output in Impact Factor Journals

SN	Category of Impact Factor (IF)	No. of Publications	Percentage
1	Without IF	149	46%
2	IF between 1-5	170	52.3%
3	IF between 6-10	6	1.7%
4	IF between 11-15	0	0
5	IF More than 15	0	0
Total		325	100%

(Source: Data as reported by faculty members)

From the table - 12, it has been found that majority (52.3%) of research publications have been published in the journals with Impact Factor (IF) 1-5 whereas 1.7% publications appeared in journals with Impact Factor 6-10. There is a significant number of publications (46%) published in the journals without any Impact Factor. However, no publications are reported with Impact Factor more than 11.

l) Number of Citations based on Google Scholar (since 2010)

Analysis of the number of citations based on Google Scholar since 2010 has been discussed in table - 13. It has been revealed that the majority of publications (52%) have been reported as without any citation. Further, 42% publications have citations range 1-25, 3% publications have citations range 26-50, 1% publications have citations range 51-75, and 2% publications have citations range more than 75.

Table - 13: Number of Citations based on Google Scholar (since 2010)

SN	Number of Citations	No. of Publications	Percentage
1	Without Citations	285	52%
2	Citations between 1-25	229	42%
3	Citations between 26-50	16	3%
4	Citations between 51-75	7	1%
5	Citations more than 75	9	2%
Total		546	100%

(Source: Data as reported by faculty members)

m) Number of Citations based on Scopus (since 2009)

Analysis of the number of citations based on Scopus since 2009 has been discussed in table - 14.

Table - 14: Number of Citations since 2009 based on Scopus

SN	Number of Citations	No. of Publications	Percentage
1	Without Citations	63	58.3%
2	Citations between 1-25	37	34.2%
3	Citations between 26-50	6	5.5%
4	Citations between 51-75	1	1%
5	Citations more than 75	1	1%
Total		108	100%

(Source: Data as reported by faculty members)

Based on the observation of table - 14, the majority of publications (58.3%) reported without any citation while 34.2% publications have citations range 1-25, 5.5% publications have citations range 26-50, 1% publications have citations range 51-75, and 1% publications have more than 75 citations respectively.

n) *h-index* and *i-10 index* since 2010 based on Google Scholar and Scopus

Analysis of *h-index* and *i-10 index* since 2010 based on Google Scholar and Scopus databases have been discussed in table - 15. It included faculties having at least 5 *h-index* values.

Table - 15: *h-index* and *i-10 index* since 2010 based on Google Scholar and Scopus

School	Name of Faculty	<i>h-index</i> value		<i>i-10 index</i> value	
		Google Scholar	Scopus	Google Scholar	Scopus
School of Life Science	Bhim Pratap Singh	6	--	5	--
	G S Solanki	6	--	3	--
	G C Jagetia	31	--	72	--
	A K Trivedi	5	--	4	--
School of Physical Science Mathematics & Computer Science	Diwakar Tiwari	18	18	27	--
	Ved Prakash Singh	5	--	2	--
	S S Singh	5	2	3	1
	R K Thapa	8	--	5	--
	B Lalremruata	5	--	3	--
School of Earth Science & Natural Resources Management	U K Sahoo	6	--	3	--
	S K Tripathi	13	--	14	--
	V P Sati	6	--	3	--
	A C Shukla	7	--	6	--

(Source: Data as reported by faculty members)

From the analysis of table - 15, it has been found that out of 80 faculties, 35% faculties have shared their *h-index* and *i-10 index* values. The table included faculties having minimum 5 *h-index* value. As per Google Scholar, the highest value of *h-index* is 31 for Prof. G. C. Jagetia followed by Prof. Diwakar Tiwari (18) and Prof. S. K. Tripathi (13). The *i-10 index* values reported by Google Scholar are found the highest for Prof. G. C. Jagetia (72) followed by

Prof. Diwakar Tiwari (27) and Prof. S. K. Tripathi (14). For the case of *h-index* and *i-10 index* values based on Scopus, few of faculties reported their values while the majority of the faculties does not have these values due to non-subscription of Scopus by the university.

o) Ph. D and M. Phil. Dissertations Submitted / Awarded

Analysis of the number of Ph. D. and M. Phil. dissertations submitted/awarded during the period July 2009 – June 2014 has been discussed in table - 16. Based on the observation of Table - 16, it has been found that the number of M. Phil. submission and award are very less during the study period due to less number of Departments offering M. Phil. courses in Science & Technology stream. School of Engineering and Technology had only undergraduate courses and does not offer Post Graduate and Research courses. In case of Ph. D. submission and award, total numbers of awarded Ph. D. dissertations are more than submitted. Though increase has been observed in submitted and awarded Ph. D. dissertations during the period.

Table - 16: Ph. D. and M. Phil. Dissertations Submitted / Awarded

SN	Time Duration	No. of M. Phil.		No. of Ph. D.	
		Submitted	Awarded	Submitted	Awarded
1	2009-10	0	1	1	3
2	2010-11	0	0	3	5
3	2011-12	0	0	2	7
4	2012-13	0	1	6	20
5	2013-14	1	1	12	18
Total		1	3	24	53

(Source: Data as reported by faculty members)

p) Minor/ Major Research Projects Undertaken

The number of minor/ major research projects undertaken during July 2009 – June 2014 has been discussed in table - 17. Table - 17 clearly indicates that ongoing minor research projects during the study period were few and observed in the 2013-2014 academic year only whereas completed minor projects were more than ongoing during the study period and on an average 2.6 projects completed every year during five years of study period. In case of major research projects, numbers of ongoing projects were more than completed. Sudden increase has been observed during 2012-13 and 2013-14 for ongoing major research projects while completed projects have shown their completeness since 2011-12 to 2013-14 academic years. In another way, Science and Technology departments of Mizoram University tends to get more number of major research projects than minor research projects.

Table - 17: Minor/ Major Research Projects Undertaken

S N	Time Duration	Minor Projects		Major Projects	
		Ongoing	Completed	Ongoing	Completed
1	2009-10	0	2	4	3
2	2010-11	0	3	4	6
3	2011-12	0	2	4	9
4	2012-13	0	4	13	8
5	2013-14	5	2	25	9
Total		5	13	50	35

(Source: Data as reported by faculty members)

q) Constraints Faced during Research Activities

During research, a researcher has to face many challenges. These challenges affect a researcher's performance in research activities. Table - 18 is showing such constraints faced by researchers and measured based on the five-point scale. The responses are recorded as 'Strongly Disagree', 'Disagree', 'Not Sure', 'Agree' and 'Strongly Agree'. There are a total of 80 respondents having different views on each constraint. Table - 18 displays that 36.25% faculties are 'Agree' and 5% are 'Strongly Agree' towards difficulty in locating the appropriate information resources in library whereas 32.5% faculties are 'Disagree' and 3.75% are 'Strongly Disagree' to this constraint. The majority (41.25%) of faculties is 'Agree' with the constraint. In case of an isolated location of the library, 41.25% faculties are 'Agree' as well as 25% faculties are 'Strongly Agree' to the constraint. There are 42.5% faculties are 'Agree' and 16.25% are 'Strongly Agree' that physical infrastructure available at the department are not sufficient to undertake research. With regard to Internet connectivity problem, 37.5% faculties are 'Agree' to the constraint whereas 17.5% faculties are 'Strongly Agree'. Overall, 55% faculties are facing Internet connectivity problem during their research activities. There are 42.5% faculties who are 'Agree' with the lack of financial support from the university as an inhibition during research while 32.5% are 'Disagree' to it. With regard to lack of research projects/ funding from sponsoring agency, 46.25% faculties are 'Disagree' to this opinion while 27.5% are 'Agree' that financial assistance is a problem in conducting their research work. Though the majority of them feels that research projects/ funding from sponsoring agency are not a serious problem in their research activities. With regard to lack of personal interest in research activities, 50% faculties are 'Disagree' with this opinion whereas 38.75% are 'Strongly Disagree'. Based on the observation, it has been concluded that 88.75% faculties have a personal interest to conduct research and this is not a valid reason for their lower research output. To know whether family responsibilities played a role in decreasing research interest, 35% faculties 'Disagree' to this opinion while 21.25% are 'Strongly Disagree'. About 21.25% faculties agree that family responsibilities affect their research interest.

Table - 18: Constraints Faced during Research Activities

SN	Inhibitors/ Constraints	SD	D	NS	A	SA	Total
1	Difficulty in locating the appropriate information resource in the library.	3 (3.75)	26 (32.5)	18 (22.5)	29 (36.25)	4 (5.0)	80 (100.0)
2	Isolate location of the central library from your workplace.	3 (3.75)	16 (20.0)	8 (10.0)	33 (41.25)	20 (25.0)	80 (100.0)
3	Lack of physical infrastructure in your department.	5 (6.25)	19 (23.75)	9 (11.25)	34 (42.5)	13 (16.25)	80 (100.0)
4	Internet connectivity problem.	1 (1.25)	23 (28.75)	12 (15.0)	30 (37.5)	14 (17.5)	80 (100.0)
5	Lack of financial support from the university.	1 (1.25)	26 (32.5)	15 (18.75)	34 (42.5)	4 (5.0)	80 (100.0)
6	Lack of research projects/funding from sponsoring agency.	3 (3.75)	37 (46.25)	16 (20.0)	22 (27.5)	2 (2.5)	80 (100.0)
7	Lack of your personal interest in research activity.	31 (38.75)	40 (50.0)	7 (8.75)	2 (2.5)	0 (0.0)	80 (100.0)
8	Family responsibilities decrease your research interest.	17 (21.25)	28 (35.0)	17 (21.25)	17 (21.25)	1 (1.25)	80 (100.0)

Legends: SD=Strongly Disagree, D=Disagree, NS=Not Sure, A=Agree, SA=Strongly Agree

Note: Figure given in brackets represents percentage.

7. Suggestions for Improvement of Research Output

The faculties have been asked to provide suggestions, if any, for the improvement of the Science & Technology department's research output. Following are some suggestions provided by the faculties belong to Science & Technology departments of the university:

- All kind of local interferences should be stopped during the selection of suitable and research-minded research scholars in the departments. Research scholars selected through some interference does not have any research capability and tends to scholarship (financial goal) only.
- There is a lack of subscription of sufficient online journals and databases of Science & Technology stream in the library which should be increased.
- There is inadequate research scholars' laboratory, equipment, facilities, glassware, and classroom facilities which should be improved. Apart from the physical infrastructure, the land facility is inadequate to carry out field-based research in some Science departments. There are many complications in financial assistance with the sponsoring agency and sometimes from the university itself hampers the research activities.
- The extra workload of CBCS pattern of academic programs reduces the time slot for research activities.
- The poor and disturbed Internet connectivity creates a problem during research communication, data collection, information or literature searching, and updating the existing knowledge.
- Due to hilly terrain, access to Central Library is not easier for every department due to the distance which causes transport problem and it is time-consuming also. Library opening hours on paper is more but library staff used to close it before time and sometimes not co-operative also.

8. Research Findings

The analysis of the data collected through the questionnaires has revealed a number of findings which are as follows:

- Out of the total, 80.8% faculty members responded to the questionnaires distributed to them. The highest response rates (100%) came from Botany, Geography & Natural Resources Management, Civil Engineering, and Planning & Architecture departments. There are 80% male and 20% female respondents. The majority (47.5%) of the respondents belong to 31-40 age groups. Interestingly, all the female faculty members are young and they all belong to less than 40 years of age.
- The majority (74%) of faculty members belong to Assistant Professor out of which 66% have less than 40 years of age. In terms of age and academic positions, Assistant Professors belong to younger age groups (i.e. <40 years) while Professors belong to higher age groups (>40 years).
- The majority (66%) of faculty members are Ph. D. qualified and amongst Ph. D. qualified faculty members 62% belong to Assistant Professor. There are 27.5% faculties are Master Degree qualified which belongs to Assistant Professor. Amongst all Assistant Professors, 56% are Ph. D. qualified, 37% Masters qualified and 7% M. Phil. qualified whereas 100% Associate Professors and Professors are Ph.D. qualified.
- There are 41% faculties having experience of 1-5 years and all belong to Assistant Professor while 30% faculties having the experience of 6-10 years and majority belong to Assistant Professor. All Professors have experienced more than 10 years.

- There are 75% faculties having the publication range from 1-20 during last five academic years and most of them belong to Assistant Professor. Out of total Assistant Professor, 68% have publication range from 1-10 whereas, among Professors, 53% have more than 21 publications.
- More than 71% faculties have 1-10 years of teaching experience having publication range of 1-10 publications during the period.
- Majority (87.5%) faculty members preferred Journal articles as a medium of publication followed by Conference papers (48.75%) and Book chapters (21.25%).
- Multiple authorship patterns are prevalent among Science & Technology faculty members. The two authorship pattern is most prevalent followed by three authorship pattern.
- More than 52% research publications have been published in the journals with Impact Factor (IF) 1-5 whereas 46% publications are without any Impact Factor.
- Majority of publications (52%) are without any citation while 42% publications have citations range 1-25 since 2010 based on Google Scholar. Higher citation range has not been observed for many publications during the study period.
- Based on the Scopus database (since 2009), the majority of publications (58%) are without any citation while 34% publications are with citations range 1-25.
- There are 35% faculty members have *h-index* and *i-10 index* values. Prof. G. C. Jagetia has the highest *h-index* (31) value in Google Scholar as well as the highest *i10-index* (72) value.
- The number of M. Phil. submission and award are not significant during the study period whereas in the case of Ph. D., total numbers of awarded Ph. D. dissertations are significantly more than submitted.
- In case of minor research projects, completed minor research projects are more than ongoing minor research projects while in case of major research projects, numbers of ongoing projects are significantly more than completed.
- Majority of faculty members (41%) are facing difficulty in locating the appropriate information resources in library whereas 66% faculty members found difficulty in access of information resources due to the isolated location of the library from their workplace. For the case of lack of physical infrastructure in the department, the majority of faculty members (59%) are inclined that physical infrastructure available at the department is not sufficient. With regard to Internet connectivity problem, 55% faculty members are facing Internet connectivity problem during their research activity. More than 47% faculty member found lack of financial support from the university is an inhibition in their research activity. Further, with regard to the lack of research projects/ funding from the sponsoring agency, the majority of faculty members have declined this opinion. With regard to lack of personal interest in research activity, the majority of faculty members (89%) are not in favor with the opinion. Similarly, family responsibilities are not affecting the research interest of 56% faculty members.

9. Conclusion

Research output measures the outcome of a researcher in the form of publications, patents or any other. More research output by a researcher gives him more reputation and scholarly credit among the academic world. Citations to the research output and Impact Factor of the journals have created new dimensions in this regard. Faculty members are trying to publish their research outcome in quality journals with high impact factors for getting more academic credits. In the present study, it has been observed that except few cases, faculty members are

worried to produce more research output. With regard to socio-demographic study, male faculty members are dominant over female in Science & Technology departments of Mizoram University. The younger generation of faculty members is more than elder and all female belongs to the younger generation only. Assistant Professors are at the younger age while Professors are at the higher age group. The age and designation of faculties have a direct relationship with each other which reflected positively in the present study also. At all academic positions, highly qualified faculties are there while working experience and designation also have direct relationships with each other. The numbers of research output are affected by the experience of faculty members and having a direct relationship with each other. Similarly, working experience and number of research output have a direct relationship with each other. Faculties prefer to publish their research output in journals in a collaborative way. Most of the cases, research output lacks the higher range of citations which reduces *h-index* and *i-10 index* values for their research outputs. Doctoral researches are more prevalent while major research projects are more than minor research projects in their credits. There are some inhibitors to the research activities as observed by faculty members. Location of appropriate information resources in the library and isolated location of central library create hindrance in research work. Further, lack of physical infrastructure in the department and poor Internet connectivity is also a problem for running research activities properly. Lack of proper financial support from the university is an inhibition in research while research projects/ funding from sponsoring agency is not a hindrance in research. Lack of personal interest in research and family responsibilities are not the barrier to research activities among faculty members.

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