"ANALYSIS OF KEY PERFORMANCE INDICATORS (KPI) FOR QUALITY ASSURANCE IN NEWLY ESTABLISHED ENGINEERING INSTITUTES IN RURAL AREAS OF MAHARASHTRA DURING 2010-2014"

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Under the Board of Management Studies

Submitted By

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Under the Guidance of

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December 2015

DECLARATION

I hereby declare that the thesis entitled "Analysis of Key Performance Indicators (KPI) for Quality Assurance in newly established Engineering Institutes in rural areas of Maharashtra during 2010-2014" completed and written by me has not previously formed the basis for the award of any degree or other similar title upon me of this or any other Vidyapeeth or examining body.

Date :

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C E R T I F I C A T E

This is to certify that the thesis entitled "Analysis of Key Performance Indicators (KPI) for Quality Assurance in newly established Engineering Institutes in rural areas of Maharashtra during 2010-2014" which is being submitted herewith for the award of the Degree of Vidyavachaspati (Ph.D) in Management of Tilak Maharashtra Vidyapeeth, Pune is the result of original research work completed by Mr. Prakash Bhaskarrao Kulkarni (PRN : 15810004532) under my supervision and guidance. To the best of my knowledge and belief, the work incorporated in this thesis has not formed the basis for the award of any degree or similar title of this or any other University or examining body upon him.

Dr. Shriniwas S. Kulkarni
(Research Guide)

Place : Pune
Date :

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Prakash Bhaskarrao Kulkarni

ABSTRACT

India is a highly populated nation. The diversity in terms of geography, weather conditions and languages is phenomenal across the country, although, the culture remains the same. It is believed that a large majority of the people in the country belong to middle or low income group. Traditionally the school education in the country is considered to be powerful for training the students in mathematics. As majority of the students are job seekers and need to earn immediately after completing their education, many of them have started joining engineering programs, for their career. Private trusts have been permitted to set up educational institutions in India on no-profit basis and about 90% of the students undertake engineering education in private institutions. The institutes earn their cost through the tuition fees charged to the students, which are approved by the Govt. The students have a choice to join any institute in a State through a single window system. The students join such institutions which can offer jobs immediately on completion of their education. The industry has felt that many engineers have a formal degree but do not satisfy their requirements for employability.

It is a fact that there is an increase in number of seats remaining vacant out of sanctioned intake in engineering for last consecutive five years. This shows that preference of the students towards admission to engineering is declining. To some extent, it has not drastically affected to the engineering institutes which are well established and having brand name in the market. For newly established engineering institutes the admissions is a great challenge. For such institutes on one side, less number of the students are admitted in their institute which directly affects their financial management, while on the other hand, merit of the students admitted is quite low. At the same time these institutes are facing a problem of shortage of qualified and experienced teachers. This directly affects the teaching learning process, in turn in to poor examination results, which will finally affects employability of the students, when they complete the program. A study has shown that the students prefer institutions which offer better placement and have qualified faculty.

The managements of various institutions are, therefore, very keen to see how their students score enough marks in the University examination to have better University results. One of the important factor for better results is, effective teaching learning (here after referred to as T-L) process at the institute. For the effective teaching

learning process, the backbone is availability of dedicated faculty in the institute. As senior and qualified faculty is not available in adequate number, it becomes very difficult for the managements of privately funded institutions to attract good faculty in sufficient numbers. It is therefore necessary for the managements to recruit and train the faculty so that they can impart proper training to the students for enhancing their learning capabilities.

The researcher has participated in several workshops conducted by his mentor for teachers of engineering institutes and have identified parameters, in terms of qualities of teachers, which are measurable for better T-L process. For such measurements a parameter called a performance index (PI) of a teacher, has been evolved.

This research offers insight to the management and academia of newly established engineering institutes about improvement in teacher's performance, student's performance and teaching learning process so as to enhance performance of the students to make them employable. This research also proposes a model, which will help the management of such institutes to set up a monitoring mechanism, by which teaching learning process becomes effective, to sustain in the era of competition.

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List of Abbreviations

ABET	Accreditation Board for Engineering and Technology
AICTE	All India Council for Technical Education
DTE	Directorate of Technical Education
GER	Gross Enrollment Ratio
HOI	Head of Institute
IIT	Indian Institute of Technology
KPI	Key Performance Indicator
MHRD	Ministry of Human Resource and Development
NAAC	National Assessment and Accreditation Council
NASSCOM	National Association of Software and Service Companies
NCHER	National Council for Higher Education and Research
NBA	National Board of Accreditation
NIT	National Institute of Technology
NPE	National Policy on Education
NPIU	National Project Implementation Unit
PG	Post Graduate
PI	Performance Index
REC	Regional Engineering College
TEQIP	Technical Educational Quality Improvement Program
T-L Process	Teaching Learning Process
TPO	Training and Placement Officer
UG	Under Graduate
UGC	University Grant Commission
VIT,Pune	Vishwakarma Institute of Technology, Pune

Chapter1: Introduction

Overview:

India, as a nation, is a developing country. It is well understood by the society that, Technical Education will offer us an opportunity to grow wealth. Establishing an engineering institution has always been an expensive proposition. The cost of establishing any technical institution is high. Therefore, to avoid expenditure of public Funds, the state of Karnataka, followed by the state of Maharashtra adopted a policy to allow private trusts to establish technical institutes in the state. The other states have also followed the suit subsequently.

Majority of Indian population belongs to economically low or middle income group and therefore the parents of this group think that technical education would give their wards / children a job opportunity immediately after completing the education.

The economical condition of the country reached the lowest ebb in 1993 and the Government decided to open up their financial policies. This is globalization. Our markets became open and started flourishing. This allowed technical education to expand at an exponential rate and the students intake at national level started increasing from a few thousand to lacs. In the last fifteen years in engineering programs it has grown up from 1 lac to 18 lacs.

In order to ensure adequate standards of technical education, All India Council for Technical Education (AICTE) become the statutory body by an Act of Parliament in 1987. AICTE started enforcing norms and standards for technical education in the country. Till this time, the post graduate education in engineering and technology was mainly restricted with IITs or NITs and few other institutes of higher learning. To meet international standards, AICTE enforced a minimum qualification for teaching position to be a PG degree in engineering and technology. The institutions were also required to maintain a teacher to student ratio at 1:15, at under graduate level. Therefore when the intake was increasing, paucity of qualified teachers become a big challenge.

The curriculum for all these institutions has been stipulated by their affiliating universities which are established by the state governments. The curriculum to meet the requirement of modern day industry in order to compete with the globalized market. This curriculum should get updated at the speed of market development and

therefore requirement of teachers for teaching such advanced subjects /courses becomes an additional challenge.

Engineering colleges were setup initially in major cities but were also developed in the district places as well as rural parts of the country. AICTE has stipulated norms for infrastructure to be made available at the time of opening a new Institute or to run the existing Institute. It includes land, classrooms, laboratories, seminar halls, workshops, library, equipments, books etc. Every institute has to first buy a land, set up infrastructure and then open or run Institute. AICTE also insists on appointment of Principal and faculty. Hence the cost of setting up of an engineering institute has became very high and management opened institutes in rural part for want of cheaper land. However student acquires technical knowledge only through a teaching learning process. Most of the institutions concentrated on teaching just enough for the students to pass in the examination. The qualified engineers were made available to the market. Industry wants these engineers to apply their knowledge to solve problems of the society so that their product becomes saleable and profitable. Therefore industry feels today that graduates are available but they are not employable.

The management of most of the new institutions faced a problem of attracting students for admission. The students apply for and chose an institution, whether it is a government or a private institute, through a single window process of admission implemented by the state government.

The earlier research has indicated that the students choose the institute which offers employment on campus as a first priority and also look at availability of qualified faculty and university results of examination for a particular institute.

As the technical education in the country is a cost based education, the management of private unaided institution have to ensure that, they receive enough students to get adequate tuition fees to run the institute and therefore it has become very important for the management of every institution to setup a mechanism by which proper teaching learning process is set up to make the students employable irrespect of the quality and potential of the students admitted to their institute, and with teachers whichever are available to them.

The research is focused on identifying the qualities of teacher for enhancing academic performance of students in University exam, recruiting teacher of a right attitude and training them to imbibe with necessary qualities as well as to establish a monitoring mechanism for better teaching learning process.

1.1 Technical Education and National Development

Science and technology plays vital role for economic and social development of nation. All developed countries in the world have acquired wealth and better living conditions of their population due to development and application of Science and technology. India being developing country also realized the importance of technical education as tool for economic development and improving the quality of life of the people in country.

The report of committee constituted by planning commission on India vision 2020 in December 2002 is based on national unity, security of food and peace, education & jobs for all, technology& infrastructural development, globalization, good governance & work values. It highlights important issue of employment and education and recommends that employment to be considered as a constitutional right of every citizen of India. Education is the basic foundation of vibrant democracy, to achieve higher rate of productivity, to generate wealth & employment opportunities. Technical education offered by large number of engineering colleges need to be upgraded to quality standards as good as to the level of Indian Institutes of Technology (IITs). [1]

1.2 Technical education in India: Pre Independence

In the world, technical education was started after invention of Steam Engine by James Watt (1780). To name a few technical institutes are Jon Anderson at Glasgow, London, now known as Royal Technical College (1790), Ecole des Traveaux, France, now known as Ecole Polytechnic (1794), Bowdoin College, New York, USA (1823). After the battle of Plassey in 1754, British movement changed from traders to colonizers. To rule the country, it was a need of the time to understand topography of India through civil survey and therefore, first survey school in Chennai (1794) was started, now known as Engineering College, Guindy. Also to train the person for civil and other Engineering activities, additional three colleges i.e. Roorkee (1847), Pune (1854) and Sibpur (1856) were set up. Other prominent institutions, IISc by House of Tata (1908) and Banaras Hindu University (BHU) by Pandit Madan Mohan Malaviya (1916) were established. Finally, twenty four Engineering colleges with 2570 intake, out of which six institutes were offering P. G. with intake 70, were available at the time of independence.

Various commissions were set up for framing policies for development of higher education such as Indian University Commission (1902), Education Policy (1913),

Indian Industrial Commission (1916), Central Advisory Board of Education (CABE – 1943), Resolution to set up All India Council for Technical Education (AICTE – November,1945), Sarkar Committee (1945).[2]

1.3 Technical education in India: Post Independence

Existence of five IIT's at Kharagpur (1951), Bombay (1958), Madras (1959), Kanpur (1960) and Delhi (1961) is the outcome of recommendations of Sarkar committee. In due course, up to 2009, Government of India established 15 new IIT's. The next tier of institutions, 20 NIT's (old REC's), were established followed by a large number of State Government Engineering Colleges as tier three. Few of them are autonomous and others are affiliated to university. In 1983, the scenario changed across India, after obtaining the permission by Central Government to open up Private Un-aided Self Financed Engineering Colleges in various states.

The status of present technical education is the outcome of various committees and policies, which were constituted after independence. Some of the important committees were Sarvapalli Radhakrishnan Committee (1949), M. S.Thacker Committee (1959), Education Commission/ Kothari Commission (1964), Indian Society for Technical Education-ISTE (1967), Madan Committee (1970), G. R. Damodaran Committee (1971), National Policy on Education-NPE (1979), Y. Nayudamma Committee (1978), New National Policy on Education (1986), Program of Action-POA (1992), P. Ramarao Committee (1995), Mashelkar Committee (1998), U.R. Rao Committee (2003), Kakodakar Committee (2011). The successive five year plans also contributed a lot in development of Technical Education.[2]

1.4 Structure of technical education in India

The present structure of engineering education in India is through:

A) Category: Universities and Institution of national importance created by Act of parliament are

i. Central Universities and Deemed-to-be-Universities [These Universities are created by the MHRD through gazette notification]. All colleges under this are autonomous to decide curriculum, conduct examination and award degree All IITS viz Indian Institutes of Technology [IIT]. Indian Institutes of Scientific Education & Research [IISER]. Indian Institutes of Management [IIM].
ii. In each of these IITS every department is autonomous and is free to decide curriculum, conduct examination and degree is awarded by IIT/Institute

B) Category: universities created by the Act of State Legislature are:

I) State University:

i. Affiliated colleges: in which all colleges have to teach to their student common curriculum prescribed by university, and have to appear common examination conducted by university, results are declared by university and degree is awarded by university

ii. Affiliated but Autonomous: are free to decide curriculum, conduct examination and degree is awarded by affiliating university.

II) Private University. [3]

1.5 National Policy of Higher Education of India

In 1948, the then first president of India, Honorable Late Sarvapalli Radhakrishnan, has expressed that higher education should be inclusive, accessible and should reach to everyone, fulfill needs and expectations of a common person. Education is a strong medium to bring social and financial changes in the country. Ultimately, higher education needs to satisfy national objectives such as enhancement in productivity, modernization, national unity, social and moral. [4]

National Policy of higher education of India, has elaborated the exact status of higher education. The report has mentioned some serious drawbacks and challenges that higher education is facing. Central and State Government has implemented the recommendations of NPE partially.

In India, if we want to rank technical institutes based on quality and image they carry, there is a thumb rule which says that IIT, IIM, IISc are the top most institutes followed by NIT's. At the second level, centrally funded autonomous institutes/ universities followed by the state universities and lastly affiliated institutes and private universities. After passing 12^{th}, majority of top meritorious students joins such top quality institutes and remaining students gets an admission, based on their merit, to affiliated or other institutes.

It is necessary to transform higher education to become capable and competitive to global education. The quality of higher education will be improved only if institutes/ universities will establish and fulfill those quality benchmarks/ criteria which are essential to achieve global recognition. An apex body, UGC, decides national policy on growth, funding and monitor standards as well as quality for higher education. In addition to this, the professional councils monitor quality of programs of higher education viz. NAAC 1994, AICTE 1987, NBA 1994, National Council of Teacher Education (NCTE Act) 1987, Medical Council of India 1934, Dental Council of India

(DCI) 1948, Indian Nursing Council (INC) 1947, Council of Architecture (COA) Architects Act 197, Bar Council of India (BCI) 1961, Pharmacy Council of India (PCI) 1948, Indian Council for Agriculture Research (ICAR), Rehabilitation Council of India (RCI) 1992, Central Council of Homeopathy (CCH) 1973, Central Council of Indian Medicine (CCIM) 1970, Veterinary Council of India 1984, Distance Education Council 1991.[3][5]

1.6 Role of All India Council for Technical Education (AICTE)

All India Council for Technical Education was set-up in November 1945 as a national level Apex Advisory Body in order to ensure adequate standards of technical education. As per National Policy of Education (1986), AICTE become the statutory body by an Act of Parliament in 1987. AICTE started enforcing norms and standards for technical education in the country and conducted survey on the facilities of technical education and to promote development of technical education in the country in a coordinated and integrated manner.

AICTE becomes statutory authority for planning, formulation and maintenance of norms and standards, quality assurance through accreditation, funding, monitoring and evaluation, maintaining parity of certification and awards. Technical education in areas of Engineering, Technology, Architecture, Town Planning, Management, Pharmacy, Applied Arts and Crafts, Hotel Management and Catering Technology etc. at different levels are in the purview of AICTE. [6]

1.7 Role of Directorate of Technical Education (DTE)

The role of the Directorate of Technical Education at state level is to maintain and enhance the standards of quality of technical education by adhering and implementing norms of AICTE .It also has responsibilities at state level, of framing policies, establishing and developing government institutions, guiding, supervising the aided and un-aided private institutions, interacting with industry and national level institutions, co-coordinating with other departments of state and central government, to achieve perspective plan for betterment of society at large.

1.8 India Vs Other countries – Engineering Education

Study was carried out for comparison of engineering education institutions in India with other prominent countries at international level in 2013. [7]

Table 1.1 India Vs Other countries – Engineering Education

Sr. No.	Country	Number of Institutions	Number of students per institution	Total number of students	Number of faculty	Number of faculty per institution	Faculty: Student ratio
1	USA	359	2213	794467	41053	114	1:20
2	UK	115	1275	146625	21475	187	1:7
3	Japan	227	2128	483056	26056	115	1:19
4	China	572	7331	4193332	283440	496	1:15
5	Brazil	561	920	516120	34949	62	1:15
6	India	3393	445	1509885	62948	19	1:24
7	Russian Federation	482	3302	1591564	107529	223	1:15

Ref: International Comparative Study – "Engineering Education in India 2013"

It is observed that, India has the greatest number of institutions as compared to other countries of the world, but engineering students per institute as well as number of teaching faculties per institute is very much less. As per AICTE norms, the faculty to student ratio at undergraduate and post graduate levels is 1:15 and 1:12 respectively. At present, in India, faculty-student ratio is 1:24 which indicates acute shortage of engineering faculty not only in terms of quantity but also quality. On an average Ph.D. qualified faculty is not more than 20%.[5][8]

As per National Knowledge Commission report, teaching profession is on the least priority of engineering graduate. Due to the shortage of faculty, many engineering institutes are forced to recruit fresh engineering graduates as teachers with no prior training or aptitude for teaching. These fresh recruits need training in pedagogy as well as knowledge improvement. [9]

1.9 Development of Engineering Education after 1983

In 1983, Government of India permitted to open private un-aided self financed professional institutes. After 1990, the spirit of globalization was responsible for industrial growth and competition resulting in boost in demand of technical manpower.

Table 1. 2 Growth of intake in AICTE approved Institutions

Year	Intake Engineering	Intake Polytechnics	Intake Total
2007-08	653290	417923	1071213
2008-09	841018	610903	1451921
2009-10	1071896	850481	1922377
2010-11	1314594	1083365	2397959
2011-12	1485894	1117545	2603439
2012-13	1761976	1212612	2974588
2013-14	1804353	1177918	2982271
2014-15	1903722	1308008	3211730

Source: AICTE Process Handbook 2015-16

1.10 Status of PhD and Research in Engineering and Technology

It is proven all over the world that, the research output of an academic institution is significantly dependent on the number, quality and dedication of its PhD research scholars and faculty available with institute.

Record shows in India, First PhD's in Engineering Discipline at University in Year are: Chemical Engineering Bombay 1940, Metallurgical Engineering BHU 1957, Electrical Engineering IIT, Kharagpur 1959, Civil Engineering IIT, and Kharagpur 1960.

The table 1.3 shows Projected Shortfall of Faculty with PhD Degree in Engineering

Table 1.3 Shortage of PhD's

Year	**Approved Intake**	**Faculty Required**	**Required Ph.D's**	**Available Ph.D's**	**Shortage of Ph.D's**
2006-07	572214	152590	50863	9387	41466
2007-08	658046	175479	58493	10807	47686
2008-09	758752	201801	67267	12428	54839
2009-10	870265	232071	77357	14292	63065
2010-11	1000805	268881	88900	16436	72524

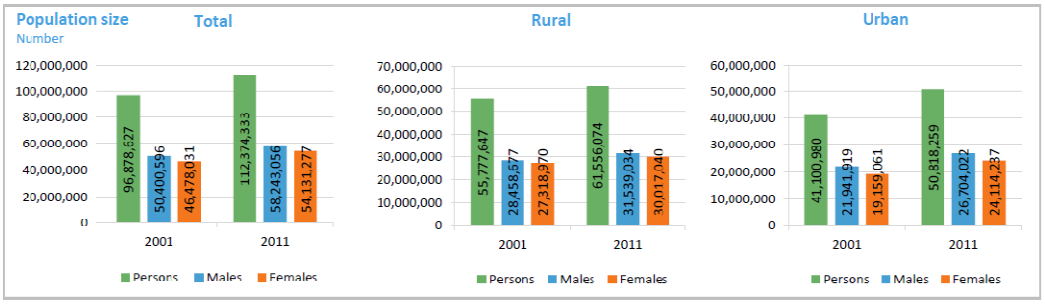
Source:http://shodhganga.inflibnet.ac.in/bitstream/10603/11039/10/10_chapter%203.pdf

It is expected that the faculty required with PhD qualification for the year 2010-11 in Engineering is 88,900. But the available PhD's are 16,436 only, resulting in a shortage of 72,524.

1.11 Profile of Maharashtra state

Maharashtra is the third largest state in India both in area and population. The state is bounded by the Arabian Sea in the West, Gujarat in the North West, Madhya Pradesh in the North and the East, Andhra Pradesh in the South East and Karnataka and Goa in the South.

The state of Maharashtra has an area of 307,713 sq. km. and has a population (as per census 2011) of 11.2 crore as compared with India (121.01crore). There are 37 districts, 358 blocks and 43711 villages. The State has population density of 314 per sq. km. (as against the national average of 312). The decadal growth rate of the state is 22.73% (against 21.54% for the country) and the population of the state continues to grow at a much faster rate than the national rate. [10]



Source: Census of India 2011 (http://censusindia.gov.in/2011census/censusinfodashboard/stock/profiles/en/IND027_Maharashtra.pdf)

Gross Enrollment Ratio (GER) and share of technical education

The economy and development of nation depends on main controlling factor such as population, culture of the people, agriculture, policies of government, educational system, industrial growth and infrastructural facilities available.

India is the second largest in the world in terms of population, but higher education has not reached to all. Majority of population is from rural area where GER is 11-13% as compared to GER (19-20%) of urban area. Gross Enrollment Ratio (GER) of higher education in 2011-12 was 17.9% which is now targeted to 25% in 2017, as per the 12th five year plan.

Report on system of education in India based on the data for 2003-04, distribution of GER across programs was 45% in Arts, 20% in science, 18% in commerce and management and 17% in professional courses. Based on the census records 2011-12,

the total population of Maharashtra was 11.23cr. The Estimated population between the age 18-23 years was 1.30cr. The Enrollment in higher education as per economic survey was 0.24cr. And the estimated GER of Maharashtra was 18.35%. The target for GER of higher education in Maharashtra by year 2020 is 35%. As per global competitiveness report 2011-2012 by Word Economic Forum, India ranks 87 out of 142 countries in higher education. The GER of all developed countries in the world is much higher than GER of India.

Table 1.4 Gross Enrollment Ratio of developed countries

Country	Rank	Gross Enrollment Ratio - Higher Education (%)	Share -Technical Education (%)
Finland	1	94.4	24.3
Sweden	2	71.1	18.5
Switzerland	3	49.4	14.8
Singapore	4	63.6	---
Canada	12	62.3	---
U.S.	13	82.9	11.0
China	58	24.5	36.1
India	87	13.5	---
Maharashtra	***---***	***18.35***	***22.0***

Source: Perspective Plan, DTE, Maharashtra

Development of Engineering Education in State of Maharashtra

Table 1.5 shows the journey of engineering education in the state of Maharashtra from 1978 to 2014. This information is referred from http://www.dtemaharashtra.gov.in/approvedinstitues/CMS/Content_Static.aspx?did=40

Table 1.5 Increase in intake capacity of Technical Education in Maharashtra

Sr.No.	Type of Courses	Year	No. of Institutes	Sanctioned Intake
1	Post Graduate in Engineering & Technology	1978	9	584
		1988	11	700
		1995	14	750
		2000	15	770
		2005	41	2789
		2010	88	6081

		2014	230	19446
2	Under Graduate in Engineering & Technology	1978	16	2642
		1988	76	14275
		1995	94	22740
		2000	129	38939
		2005	154	46325
		2010	309	114268
		2014	367	163895
3	Diploma in Engineering. & Technology	1978	28	5145
		1988	127	23436
		1995	160	30000
		2000	170	34295
		2005	174	68685
		2010	387	132632
		2014	493	181912

Perspective Plan of Government of Maharashtra

In 2012, Directorate of Technical Education, Maharashtra proposed the perspective plan of Technical Education based on Vision 2020. It includes plan of expansion, inclusiveness, quality and research, role of ICT in technical education and mechanism for monitoring and evaluation of quality of the institute. http://www.dtemaharashtra.gov.in/approvedinstitues/Notifications/Notification_14_2_2013_1774387563.pdf?did=285?did=332 [11]

The projected intake capacity of technical education in Maharashtra is based on three criteria such as international benchmarking, industrial demand and social development perspective.

Table 1.6 Projected Intake Capacities in Technical Education

Year	2015-16	2016-17	2017-18	2018-19	2019-20
Intake	467725	496617	527744	561308	607954

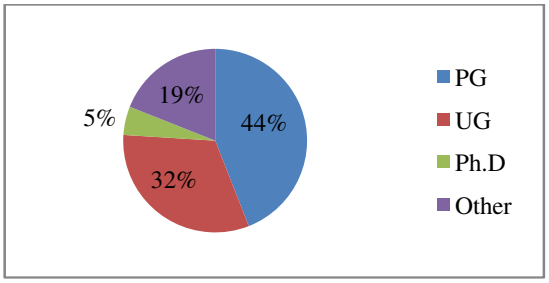
Passing Rate: On the other hand the statistics depicts the number of students actually admitted and passed in degree and diploma from the academic year 2000 to 2008.

Table 1.7 Students Academic Performance

Year	Degree			Diploma		
	Admitted	Passed	% result	Admitted	Passed	% result
2000	40464	19695	48.67	31715	21101	66.53
2003	55067	33012	59.95	39159	22371	57.13
2005	50568	39232	77.58	43709	24053	55.03
2008	60928	42537	69.82	64478	32440	50.31

For degree, it is observed that passing ratio has increased from 48% (2000) to 70% (2008) while for diploma, it has decreased from 66% (2000) to 50% (2008) .

Qualification and Teacher Student Ratio: Teacher–Student ratio for degree and diploma, in 2008 was 1:19 with Qualifications as 44% Post Graduates, 32% Under Graduates, PhD 5% And Other 19%.



Graph 1.1 Qualifications of Faculty

Campus Placement**:** From employability perspective, the comparison indicates the campus placement of graduates passing out from various universities of Maharashtra is significantly less than renowned universities across the globe.

Table1. 8 Teacher-Student Ratio and Campus Placement comparison

International Benchmark	Harvard University	Boston University	Cambridge University	Maharashtra
Faculty-Student Ratio.	1: 6.7	1:4	1:11.7	1:19
Placement Rate	83%	82%	95.2%	44%

The immense growth in intake and institutes in Maharashtra was observed after 1983

1.12 Challenges to Management of Private Self Financed Engineering Institutes:

In the state of Maharashtra, many private charitable trusts who are willing to impart technical education and would like to contribute to the national development, have established their institutes in rural places instead of urban places. This is mainly to reduce the investment required for purchase of land as per AICTE norms. While

establishing the institute and imparting the technical education, management faces the following challenges :

a) Admissions: Although the charitable trusts establish engineering institutes, they have to be self sustainable. The income to such a institutes is only the fees charged to the students. The admissions of affiliated (private and government) institutes to the aspiring students are offered through a single window system by state government. It has been found that , it has become a major challenge to newly opened institutes as described in section 5.1.1 of this thesis.
b) Administration: Absence of awareness to manage engineering institutes which are professional institutes and are completely different from other educational institutes like schools, junior and senior colleges , especially because of stringent norms stipulated by AICTE. Further operational issues like transport facility for students, water and electricity supply, ongoing construction, local issues and political environment, internet connectivity, skilled manpower for timely repair and maintenance of infrastructure , identification of vendors for supply of quality equipment and library books, hostel and canteen facility.
c) Academics: Recruitment of qualified teachers, retention of good teachers, training of faculty, lack of experienced faculty, development of laboratories and library, time table management due to dependability on local transport, frequent changes in time table, difficulty in identifying extra time beyond institute hours for value added inputs to students, understanding capacity of available students, medium of instruction in English, inadequate industry institute interaction for recruitment/placement.
d) Financial Management: Insufficient funding for various additional facilities, fund management due to vacancy during admission, collection of 100% fees from admitted students, admission cancellation, and large failure rate of students.
e) To follow the norms and conditions prescribed by AICTE, DTE, and University etc.
f) Improvement in teaching learning process
g) Attract job offers through campus placement

1.13 Rationale for the study

Majority of engineering institutes are in affiliating pattern. To maintain quality in such affiliating institutes where design of curriculum, conduction of examination, declaration of result as well as award of degree is under control of university. These institutes' role is to implement the curriculum. The authorities like AICTE, DTE , University expects implantation of prescribed norms regarding infrastructure, staff recruitment, facilities, finance, equipment as per sanctioned intake capacity from self financed private institutes. The other expectations of government authorities are :

- Enhancement in higher GER of technical education particularly in rural areas
- Institutes must admit the students through single window system prescribed
- Institute must be accredited as and when it become eligible for the same

On the contrary, the self financed private institutes in rural areas are facing following issues:

- Students and parents prefer well established institute in city rather than rural place.
- Large number of vacant seats at the time of admission which affects on economic condition of the institute
- Academic Quality of students admitting in such institutes is poor .
- Shortage of qualified and experienced faculty
- Staff Training to implement effective teaching learning process

After understanding importance of technical education in National Development, role of AICTE,DTE, status of engineering education in India as compared with other prominent countries at international level, growth of Engineering Education after 1983, Status of number of PhD and Research in Engineering and Technology, it was essential to study situation of Maharashtra state in context to Gross Enrollment Ratio (GER) and share of technical education, growth of Engineering Education, number of Engineering Institutes located in Urban and Rural Area, Perspective Plan of Technical Education based on Vision 2020 of Government, projected intake capacity of technical education in Maharashtra, Passing Rate, Qualification and Teacher Student Ratio, Campus Placement. Based on the above information, it was possible to define rational behind study.

The earlier evidences insist that for fast development of nation, it is preferred to have higher GER in education, particularly in technical education. In view of this, growth

of engineering institutes is a necessity as per policies of government and AICTE over the period. Establishing engineering institutions has always been an expensive proposition. State of Maharashtra adopted a policy to allow private trusts to establish technical institutes in the state. It is equally important that all such institutes must maintain quality standards as prescribed by the authorities.

Technical education has expanded at an exponential rate and intake at national level has grown up to 19 lacs in engineering and 13 lacs in polytechnic. AICTE started enforcing norms and standards for technical education in the country.

Majority of Indian population belongs to economically low or middle income group and thought that, technical education would give their wards / children immediate job opportunity

Therefore large number of student preferred to take engineering education as first choice. Limited seats were available in govt. or govt. aided institute. Majority of student joins self financed private un aided institute. Therefore share in engineering education of private self financed institutes is @ 90%. It was essential that such self financed private un aided institutes must grow and contribute for the development of nation and also maintain the quality standards in spite of different challenges that they face in beginning.

In last 5-6 years, situation of self financed institutes has become alarming in respect of admission of student to their institute. Existence of large vacancy (less admission) has drastically affected financial stability of management there by development/question of existence of institute. And in particular for those institutes which are newly established and located in rural places.

The rational of this research study is based on thought that, in what way newly established engineering institutes located in rural places (irrespective of geographical location) will have to maintain academic standards, implement effective teaching learning process to have 100% admissions in their institute is a concern.

This research will focus on components of teaching learning viz. faculty and their performance, student's performance, a mechanism to monitor these aspects on timely basis and relation between performance of teacher and students.

1.14 Basis for Research Work

The motivation for the research work is future scope of the research "Investigation on Improving Quality of Technical Education in a Self Financed Institution … A Management Perspective" by Prof (Dr) Hemant Abhyankar. In this it was investigated that, while seeking admission to engineering college, a student has to choose an institute for giving his preferences. What are the parameters that influence student/parents to take admission in a particular institute? It was proved that, if adequate information is available, students prioritize the following parameters while choosing an Institute. As per the outcome of survey done, following are the ranked parameters.

Table 1.9 Preference by students while selecting institute

Parameter	Choice of Parameters	
	% index	Rank
Good Placement (Job)	89.58	I
Qualified faculty	84.85	II
University Results	73.32	III
Spacious library	67.85	IV
Posh Building	35.77	IX
Attendance Compulsion	44.69	V
Sports facility	43.84	VI
Mess facility	40.07	VII
Comfortable Hostel facility	38.27	VIII
Closer to Big City	33.06	X

In the perception of faculty, following parameters were given to define good / quality institute with priority.

Table 1.10 Preference by faculty while deciding good institute

Parameter	Choice of Parameters	
Qualified Faculty	53.78	I
Curriculum	43.16	II
Classroom Teaching	37.74	III
Academic Ambiance	34.42	IV
Library Facility	34.34	V
Cont. Assessment	30.17	VI
Leadership	28.8	VII
Infrastructure	25.6	VIII

From Table 1.9 and 1.10, it is very much clear that, the top parameters which will lead to make the institute, a good quality institute are campus placements, teaching

learning process which includes qualified faculty, classroom teaching, and University results. Student prefers such good quality institute for taking admission to complete their engineering education.

It may be noted that, the researcher has been associated with the research work since beginning and present thesis is an out-come of scope of further research from previous PhD research.

1.15 Motivation:

The cost of establishing any technical institution is high, that to when it is in city due to unaffordable land cost, construction cost and other resources .Therefore, trend is to establish engineering institutes at rural places in Maharashtra, but on other hand in last 5-6 years, it is a fact that these institutes are suffering vacancy problem (less admissions) at the time of admissions.

The research work tends to identify how the vacancy will be drastically reduced (increase in admissions) based on the identified parameters of good institute that are campus placement and teaching learning process which plays important role for getting good university result. Thus the objective of research is to improve teaching learning process which will affect on admissions positively and lead towards survival of rural institutes. The proposed mechanism will help the management of such institutes as guidelines.

1.16 Need and Significance of Study

Job offers through campus placement is always a key factor while selecting the institute for engineering education by parents as well as aspiring students. The same factor is affecting a large number of newly started private unaided self financed institutes. At present the scenario is, most of the seats are remaining vacant in such institutes. This factor directly affects financial management of newly stared institutes. The management is keen to ensure 100% admissions in their institute. To attract the students to the fullest capacity of the intake, teaching learning process carried out in such institutes must be effective. And to make it more effective, the institutes are always in need of good and qualified faculties.

Since the key performance indicators which will measure academic performance of teacher and student, are not available for newly established unaided self financed institutes, the objective of this research is to identify such indicator(s). Another objective of study is to provide the guidelines for achieving better results for such

identified indicator(s) which will help the management of such institutions to overcome the above mentioned challenges.

1.17 Summary

Understanding the importance of technical education in the development of nation, India vision 2020, Information regarding status of engineering education in India in pre & post independence era as well as its growth after 1983, Status of Ph.D and Research in Engineering and Technology**,** comparison of technical education in India with developed country was collected. It was essential to know, structure of education in India, and role of AICTE, DTE.

Researcher has studied profile of Maharashtra state with respect to GER, growth of engineering education in Maharashtra, Perspective Plan vision 2020 of Government of Maharashtra, number of Engineering Institutes located in Urban and Rural Area of Maharashtra. It has been observed that majority of engineering Institute are Private Self Financed Institutes.

If engineering education has to grow to match vision2020 of India and of Maharashtra with quality, the researcher has identified, what are the challenges faced by Management of Private Self Financed Engineering Institutes? This leads to rational behind study & Motivation. The information collected above narrates Need and Significance of Study.

1.18 Scope of the study

The scope of the study is to understand presently available monitoring mechanism to assure quality standards for well established institutes and identify Key Performance Indicators (KPI) for newly established engineering institutes. Use of these KPI to ensure quality teaching learning process through monitoring mechanisms which will result for improving admission status by reducing vacancy at the time of admissions especially in rural area. Ultimately such processes can be made useful to newly established engineering institutes.

1.19 Organization of the thesis

This thesis is structured into eight chapters.

Chapter 1:

Chapter 1 consists of understanding present status and need of engineering education in India followed by Maharashtra. Challenges faced by Private Self Financed Engineering Institutes and their visionary private charitable trusts that are willing to

impart technical education and would like to contribute to the national development. It includes rational behind study, basis for Research Work, Motivation, Need and Significance of Study, along with fact finding and relevant information.

Chapter 2:

Chapter 2 consists of review of literature. The work carried out by the researcher is mentioned in this section to understand the present scenario of the research undertaken. A study of literature is carried out to understand the perspective of monitoring mechanisms viz NBA,NAAC for quality of education, teaching learning process, availability/shortage of teachers ,qualities of good teacher, students feedback system, performance measurement of teacher and students, employability and TQM , ISO techniques.

Chapter 3:

Chapter 3 consists of framing statement of the research problem**,** objective of research work, various definitions and framing of hypotheses with its justification.

Chapter 4:

Chapter 4 consists of the research methodology implemented to carry out the research work.

Chapter 5:

Chapter 5 consists of analysis of collected data, and its interpretation.

Chapter 6:

Chapter 6 consists of observations and findings of the research work.

Chapter 7:

Chapter 7 consists of testing of hypotheses.

Chapter 8:

Chapter 8 consists of conclusions to this research work. The benefits of proposed model are also mentioned in this chapter. This chapter gives overview of complete research work and also proposes scope for future work.

Publications:

This section consists of the research papers published by the researcher based on the research carried out. The research papers are published in International Conference and National Conference as the first author and co author as well.

References:

This section consists of all the references referred by the researcher to study the present facts and scenario regarding quality in education, teaching learning process, and measurement of performance of a teacher and student in India.

Annexure:

This section consists of

Annexure 1: Students academic record – A Sample

Annexure 2: Hypothesis testing snapshots of SPSS

Annexure 3: Publications by researcher on the basis of the research topic

Annexure 4: District wise vacancy position in UG Engineering - 2012-13

Chapter 2: Review of Literature

Introduction:

The aim of the researcher during literature survey was to understand how higher education is different in India as compared to International scenario. The focus was on engineering education. During literature survey, the researcher was trying to understand (i) the meaning of quality in education, quality teaching, the various systems to ensure the quality in engineering institutes, Key Performance Indicators (KPIs) with the focus on Teaching Leaning Process, (ii)effective teaching learning methods & processes,(iii) Availability of teacher ,measurement of performance of a teacher and student (iv)Quality Management Techniques available at present such as Total Quality Management System (TQM), role of ISO, six sigma concepts, to improve the quality of teaching learning process. (v)The researcher has also tried to identify needs of students and their perception regarding teaching learning process.

The ultimate aim, kept in mind was, to identify the factors that will attract 100% student for admission in a Institute, which will fulfill their wish of getting job placement and methodology to enhance the Teaching learning processes as a final outcome.

2.1 Literature Review

Definition of Quality in Education:

As per Oxford dictionary "quality is degree especially high degree of goodness and worth". Juran defines quality as "fit for its purpose". Philip Crosby defines as "Conformance to specification". For education, "the quality is degree to which education prepares students to be personally effective and capable within the circumferences of their work".

As per report of the working group on technical education for the XII five year plan for strengthening Private Technical Institutions in the Country where, more than 90% institute are private unaided institutions (PUIs),and their challenges with respect to achieving 'Quality' in private engineering education have to deal with 1) Strengthen Faculty, 2) Provide colleges with more academic autonomy, 3) Enhance transparency in governance and regulation of these institutions and 4) Improve their finances. [5]

Quality Monitoring Mechanisms in Technical Education

Two autonomous boards, NAAC and NBA have been established to assess quality of education in the country out of which 'NBA' accredits the technical programs while 'NAAC' assesses the overall performance of any institute or university as a whole.

A) NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL (NAAC)

It was established in 1994 as an autonomous institution of the University Grants Commission (UGC). The framework of NAAC for accreditation is based on five aspects.

(i) Contributing to National Development, (ii) Fostering Global Competencies among Students, (iii) Inculcating a Value System among Students, (iv) Promoting the Use of Technology, (v) Quest for Excellence

NAAC assessment is based on 7 parameters viz. Curricular Aspects, Teaching-Learning and Evaluation, Research Consultancy and Extension, Infrastructure and Learning Resources, Student Support and Progression, Governance, Leadership and Management, Innovations and Best Practices.

The eligible institutes for NAAC assessment are those who are offering degree programs and have passed out at least two batches of the students from the institute. Based on the performance of the institute, the NAAC committee offers grades to the institute as follows. [12]

Table 2. 1 NAAC Grading

Average CGPA	Grades	Remarks
3.01-4	A	Very good(Accredited)
2.01-3	B	Good (Accredited)
1.51-2	C	Satisfactory (Accredited)
<1.5	D	Unsatisfactory(Not Accredited)

B) NBA Assessment

Due to unprecedented expansion of technical education, it was concern to ensure quality of the education .AICTE has constituted in 1994, National Board of Accreditation (NBA) to conduct evaluation of programs of technical institution on the basis of laid down norms mentioned in manual 2000, 2004,2009,2012. Before 2009 accreditation was based on input output approach. Further norms (2009

onwards) are outcome based in order to make it substantially equivalent to Accreditation Board for Engineering and Technology (ABET) and as per 2015 guidelines which are,

1. Engineering knowledge
2. Problem analysis:
3. Design/development of solutions
4. Conduct investigations of complex problems
5. Modern tool usage
6. The engineer and society
7. Environment and sustainability
8. Ethics
9. Individual and team work
10. Communication
11. Project management and finance
12. Life-long learning

Table 2.2 Comparative study of criteria of NBA assessment

Criteria	**Descriptor 2010**	**2009**	**2004**	**2000**
1	Organization and Governance, Resources, Institutional Support, Development and Planning (100)	Organization and Governance, Resources, Institutional Support, Development and Planning (150)	Organization and governance (80)	Mission, goals and organization(100)
2	Teaching and Learning Processes(100)	Evaluation and Teaching-Learning Process (175)	Finance ,resources, allocation and utilization(70)	Financial & physical resource & their utilization(100)
3	Students' Entry and First Year Performance(75)	Students' Entry and Outputs (150)	Physical resources (central facilities) (50)	Human resources(200)
4	Students' Performance in the Program(75)	Faculty Contributions (150)	Human resources: faculty and staff(200)	Students(100)
5	Faculty(150)	Facilities and Technical	Human resources:	Teaching learning(350)

		Support (75)	students(100)	
6	Facilities and Technical Support(75)	Continuous Improvements (75)	Teaching learning processes(350)	Supplementary processes(50)
7	Continuous Improvements(75)	Curriculum (125)	Supplementary processes(50)	Industry-Institute Interaction(70)
8	Curriculum(100)	Program Educational Objectives – their Compliance and Outcomes (100)	Research and development and interaction effort(100)	Research and development(30)
9	Program Educational Objectives(150)	-	-	-
10	Program Outcomes and Assessment(100)	-	-	-
Total	1000	1000	1000	1000

And the program in the institution will be awarded accreditation status on the basis of:

1. Score ≥ 750, accreditation will be for 5 years.
2. Score between 600 - 749, accreditation will be for 2 years.
3. Score < 600, program will not be accredited.[13]

C) Other Mechanisms

Every AICTE approved institute in the state has to follow the norms and standards prescribed by DTE, Maharashtra and affiliating universities. Majority of these norms are based on:

- To follow the norms and standards as per University Act 1994
- To establish a Local Management Committee (LMC)
- Provision of suitable and adequate physical facilities such as buildings, laboratories, library, equipments, computers, gymnasium, etc.
- Financial provision of funds for working and maintenance of an institute
- Recruitment of teaching and non teaching staff as per the norms.

At the outset, affiliation and recognition of the institute is strictly based on the implementation of academic, administrative and financial standards. http://www.unishivaji.ac.in/MUAct1994_040114.pdf [14]

D) National Project Implementation Unit (NPIU) -Impact evaluation of TEQIP-I

In 2002-03, the Government of India with the financial assistance from the World Bank launched a Technical Education Quality Improvement Programme (TEQIP) in three phases. In the first phase of TEQIP (2003-09), 127 institutions were selected based on eligibility criteria to take part in the program. It includes 18 centrally funded institutions, 68 State funded institutions, 22 private unaided institutions and 19 Polytechnics spread across 13 States of India. The objective of TEQIP was focused on pedagogical training of faculty for effective teaching and enhancing institutional and system management effectiveness along with the better employability.

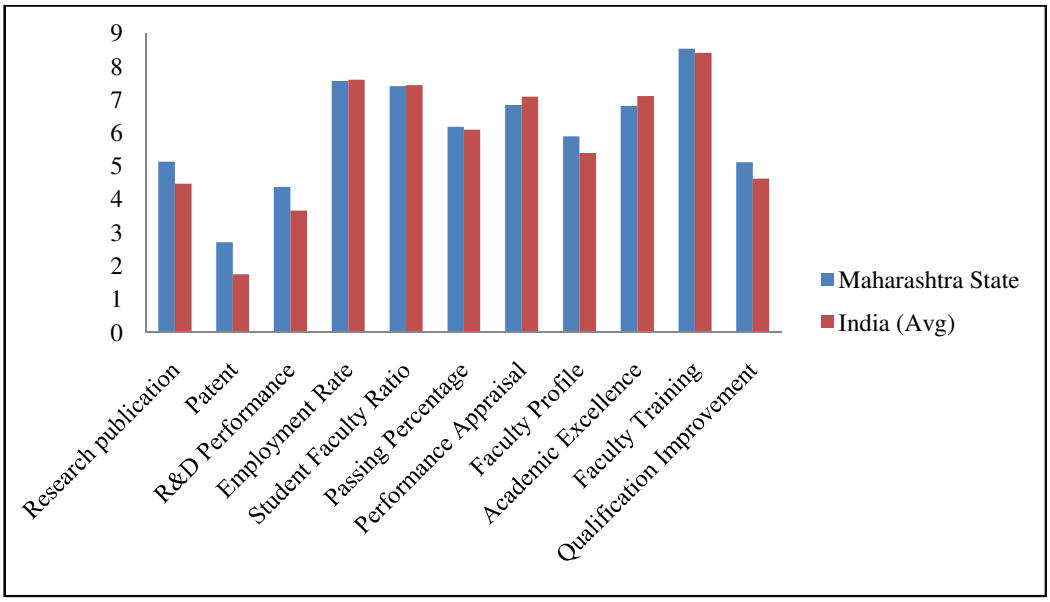
TEQIP was implemented on five components such as:

a. Institutional reforms
b. Institutional governance
c. Academic Excellence (Accreditation, Revision of programs, tribal development plan, faculty training, faculty qualification improvement)
d. Networking of the institutes and
e. Services to community and economy

M/s Spectrum Planning India Ltd, (SPIL) carried out data analysis of above five components and declared institutional scores on a 10 point scale for 127 Institutes. Out of 127, only 17% of the institutions are at highly satisfactory range and 24 % in satisfactory range.

The impact of implementation of TEQIP was measured on 76 parameters and the outcome in terms of 11 performance key indicators (KPIs). [15]

The graph depicts the KPI's of 17 institutes which have participated from Maharashtra as compared to India on average basis.



Graph 2.1 Key Performance Indicators (KPI)

Dr. Medha Gupte mentioned that in India, the majority of the population is residing in rural area but the adverse part is the Gross Enrollment Ratio (GER) is much lesser in rural area as compared to urban area. It is desired to have at least 20% GER for rapid development of the nation as per the UNESCO guidelines. The reason for low GER includes inadequate quality institutions, high level of dropouts, high cost of education, lack of equity, political intervention, inadequate infrastructure and absence of competent and qualified faculty. In addition to this, students and parents are not willing to join the higher education due to family burden, lack of monetary support and wrong attitude which leads to high dropout rates. The qualified and quality teachers always prefer a job in the urban area since they also expect management support, better physical facilities, etc.[16]

Since the education as a service industry, is a part of the globalization process under the umbrella of General Agreement on Trade in Services [GATS],what Challenges that Teachers is facing in the era of Globalization ,and the challenge in front of the institutes is to remain in the world of competition. It is expected that the challenges are to be met with a joint effort by the government, students and teachers. This is going to result in a pleasant scenario says Daware Surendra. [17]

Study done by Gautam Chandra Deb identifies the growth of higher education, its problems and government initiatives towards improvement of higher education in India. Since immense growth is observed in the higher education in India, the key challenges to institutes offering higher education are demand-supply gap, quality education, research and development and faculty shortage. Various committees have recommended the Government to take steps like establishment of National Commission for Higher Education and Research (NCHER), independent regulatory authority for accreditation and national database of academic qualification, increase in number of universities including IITs, IIMs, and NITs during 11^{th} five year plan and increase in the number of seats in existing institutions. [18]

The decade of 1951-1961 has established a great reputation for undergraduate engineering not only in India but across the world by establishing Indian Institute of Technology (IIT) at various locations across India. But this has not happen for PG & PhD education. E.C.Subbarao has analyzed the reason for the same. 1983 onwards, due to expansion of technical education, institutes are producing bulk graduates of a poor quality which results in un-employability. The critical reasons for this situation are rapid expansion without adequate qualified teachers and lack of academic autonomy. In addition to this, poor linkage with industry, poor quality publications and no international collaboration for teaching and research. [19]

Anil R. Sahu et. al have developed a mathematical model to implement Total Quality Management in the institute, based on Administration, Infrastructure, Teaching Effectiveness, Students, Interaction with Industry and Society, Extra Curricular Activities , Research and Development to monitor the progress of the institute. [20]

To develop excellence in the institute, it is necessary to identify the problems/ issues that the institutes are facing. These are categorized in four major categories as academics, administration, research and development as well as infrastructure development by Rohit Manjule et al. and suggested a Total Quality Management (TQM) as a tool for solution of the problem and thereby enhancing the quality of an institute. [21]

Pradeep Khanna proposed factors for improving and enhancing quality of education through job security of faculty, rewards and awards system, industrial training to teachers, academic environment of Institute, motivation to faculty, effective student feedback system, developing positive attitude to work with efficiency, productivity and excellence. [22]

Offering of the quality of education and overall performance of engineering institutions is not satisfactory. Failures of student in the university examination and less placement opportunities are considered as defects. For improving quality level of performance in the academic activities for achieving quality assurance in technical institutions. A combination of TQM and Six Sigma is proposed by A. Pal Pandi et al. [23]

Vidya Yerneni et al.defines higer education as education beyond school. Also mention need to bring clarity and a common understanding of higher education in India and it is required to develop different kinds of model to improve the quality of higher education Using combination of six sigma, lean management, lean six sigma as the tools and techniques to improve higher education. [24]

To understand what is Six Sigma and how it can be applied in educational field to participate in today's competitive world. The parameters of six sigma were proposed for implementation and monitoring are : clear definitions of roles and responsibilities, evaluation of SWOT analysis of institute and control on processes and documentation.

It has been concluded by Varsha Patil et al.that , The success depends on every employee of the organization and requires serious commitment and consistent effort from all who are involved... management, faculty, staff and students to achieve excellence in education [25]

The main purpose of quality assurance in education is to provide confidence to all stakeholders viz students and their parents, employers & professionals, govt. society etc. that the requirements for quality education are met continuously. The experience of ISO 9001:2000 based quality systems will contribute to improve quality and a dynamic of continuous quality improvements in an institute says, Manpreet Kaur et al.[26]

The review report addresses three simple questions to define a framework for professional learning:

a) How to achieve great teaching?
b) What are the methods or mechanisms to achieve great teaching?
c) How to promote better learning?

An acceptable teaching leads to improved student progress which is based on the following factors: Pedagogy, Quality of Instruction, Classroom climate and management, professional behavior, etc.

On the other hand the mechanisms for capturing good teaching is based on classroom observations by peers, principals or external evaluators, value-added inputs, student feedback, downward appraisal and self appraisal.

To promote better learning, teacher feedback can be used as a tool with the focus on improvement in student outcomes, self learning rather than comparisons with others, encouragement for continual learners, an environment of trust and support, and academic and administrative support by the institutional leadership.[27]

National Institute of Education (NIE), Singapore has developed Values, Skills and Knowledge (VSK) model which consists of Values (care and concern for all students respect for diversity, commitment, dedication, collaboration, sharing, team spirit etc.), Skills (Pedagogical, interpersonal, reflective, personal, administrative and management skills) and Knowledge (content, curriculum, educational policies) for preparing quality teachers particularly for fresh teacher to meet the challenges says Sylvia Chong et. al.[28]

The Indo US Collaboration for Engineering Education (IUCEE) has taken an initiative with an objective to improve the academic activities like Research and Development, Curriculum and Technology Enhanced Delivery, Innovation and Entrepreneurship, Quality & Accreditation Processes and Industry Participation. Through this program, the concept of 'Train the trainer' was successfully implemented in India which resulted in improving students' performance and satisfaction with the use of the teaching techniques. [29]

S. K. Saha suggested implementation of teaching learning with some innovative practices which will create fun like game, puzzles, dumb charades as a replacement for chalk and talk traditional method for effective teaching learning in engineering. It was implemented to a particular course and was found useful by the students. [30]

The present method of teaching learning can be more effective by using ICT enabled teaching learning to enhance the productivity of the teacher and students at large in a short period as well as use of technology like VSAT will facilitate the beneficiaries at remote places, says Deepak Phatak.[31]

Jamaliah Abdul Hamid et.al conducted study on 1552 student from business study program in three public universities in Malaysia. He identified the student's perspective about effective teaching learning with the parameters such as Lecturers' Factor, (Appearance, fairness, helpfulness, care, friendliness, communication, reliability, and credibility), Teaching Methodology (Competence, course delivery),

Course Relevance. Further it is mentioned that the students' perceptions of all three factors are based on their gender, ethnic background, highest academic qualification, and current CGPA scores. Teaching Methodology and Course based on their level of English proficiency. [32]

In view of Dr. Shahida Sajjad, Lecture, Group discussion, Individual presentation, Assignments, Seminars, Workshop, Conferences, Brainstorming, Role play, Case study are the various methods to make teaching effective where lecture method is still a preferable method by the students as compared to other methods mentioned above. This study was conducted on 220 UG student of Arts faculty in 11 different department.[33]

Total Quality Management (TQM) tool based on limited approach is suggested by Boom Han Yeap for managing the needs, expectations of the students, problems of the students and collecting feedback information. This will lead to continuous improvement in teaching and learning process. This will ultimately lead to refining, designing and redesigning the improved teaching learning process of the institute.[34]

Addressing the issue of various attributes of effectiveness and efficiency of teaching, R. Renjith Kumar suggested the attributes to measure the performance of a teacher in terms of Communication, Team effort, use of appropriate pedagogy, commitment to the profession, Classroom behavior, and Teaching efficiency. And it is a need of the hour to have multiple measures to measure different parameters of teaching effectiveness. [35]

Further, Linda Tyler suggested parameters of measuring effectiveness of teaching as: Student-performance data, classroom observation and feedback from students. The assessment of teacher effectiveness can be based on technical requirements like generalization, evaluation, extrapolation and implication. [36]

Lawrence Ingvarson et al mentioned the parameters for evaluating the teacher such as Government regulations and requirements, Professional standards, Outcomes of teaching, Theories grounded in practice, What teachers are doing, What others would like teachers to be doing and What teachers should be doing.[37]

T.H. Nguyen developed an electronic tool for measuring the teaching performance for a particular engineering course based on selected learning objectives and actions to be takenfor improvement of course quality Communication skill, Student focus, Knowledge/Expertise, Attitude about enhancing student learning, Interaction with students, Teaching performance improvement. These parameters and its evaluation is

in tune with ABET requirement. The Performance Index of an engineering class was an outcome of the experiment conducted.[38]

Pradipta Biswas et.al identified a metrics for evaluation of teacher and student's performance by a novel approach of on-line examination held at different time of a course.It is based on case study at a premier engineering institute for 4 courses. [39]

As per the notification issued by UGC, http://www.ugc.ac.in/pdfnews/3375714_API-4th-Amentment-Regulations-2016.pdf

student feedback is an integral part of academic development and in fostering quality education. Student feedback on teaching, delivery, methodology, pedagogy play pivotal role for quality education. UGC has proposed academic performance indicators (APIs) for evaluation of teachers for recruitment, career advancement and promotions on 3 criteria, out of which T-L process has 60% weightage :

(a) Teaching, Learning And Evaluation Related Activities (Minimum API required75 out of 125): is based on direct teaching, examination work, innovative T-L process adopted, teaching new courses, mentoring, updating of domain knowledge.

(b) Co-Curricular, Extension And Professional Development Related Activities.(minimum API required 15 out of 50) : is based on student related Co-Curricular activities, administrative responsibilities, professional development activities, seminar, training courses, conferences, workshops, expert talk, refreshers courses, faculty development courses etc.

(c) Research And Academic Contributions: It has 3 components

i) Publication of research paper in referred journal, publication of book or chapter of book.

ii) Research projects include sponsored and consultancy projects, outcome of Research projects in terms of patent, transfer of technology, product development.

iii) Research guidance: guiding student of M.phil, PhDs, Receipt of fellowships and awards, development of e-learning resource study materials.

All these APIs are based on the teacher's self-assessment records which are verified by screening /evaluation committee. The minimum API score required is different for different levels of promotion and between university and colleges.Teacher will have to score minimum APIs related to respective criteria, to become eligible for the scheme mentioned. [40] [41]

Student evaluation is useful, convenient, reliable, and valid means of self assessment and improvement for the teacher which motivates to improve faculty performance.

The quality of teacher, quality of the students, infrastructure, administration and extent of training and placement decides the performance of an institute. For evaluation of performance of the teacher, Avijit Muzumdar has applied Multi-Criteria-Decision Making (MCDM) technique by COPRAS method is useful to prioritize attributes which influences performance level of a teacher.[42]

The teacher assessment should be done with clear purpose to evaluate summative assessment) or formative assessment. It is recommended by Richard Felder et al. that student feedback must be averaged over at least a period of two-years.[43]

The students are the prime beneficiaries of any institute. The main role of any educational institute is to provide the best education for its students and improve their performance which leads to the best possible employability. Kinjal Jakhariya et al. suggests the prediction system through data mining for tracking the performance of students which will help to improve student's performance by the teachers of the institute.[44]

The student's performance is also dependent on environmental factor and psychological factor in addition to the factors identified by other researchers. A. Dinesh Kumar et al. claimed that the data mining technique will be useful to predict these factors and the performance of such weak students can be improved through counseling by a teacher.[45]

To serve the best purpose of education, the policy of compulsory attendance with a threshold is more advisable to improve the performance of students says Rudina Guleker .[46]

Patrick Purcell claimed that regular attendance in a class has a significant and positive effect on examination result.[47]

Sarath Chandar Rao Sanku et al., proposed solution for improving students' performance. The teacher must prepare a semester plan with continuous assessment, lesson plans and guidelines, aligning the student learning outcomes with an effective pedagogy method and to take efforts to improve English communication (oral and written) are the methods for significant improvements in student performance and motivation also.[48]

Elaine Keane et al proposed the course based model for student feedback system to improve the quality of course contents. He claims that students' evaluations of teaching are reliable and valid. To get unbiased feedback care should be taken to ensure that students remain anonymous and that faculty is not present during

administration of any feedback mechanisms used. Also the purpose of the evaluation should be clearly explained to students and information should be provided regarding the analysis of their feedback and corrective actions & plans for received information to students [49]

It is a universal truth that, a person will perform with his fullest capacity provided he/she is satisfied and derives happiness from his work. The study has shown that, the factors which affect job satisfaction positively are Work Environment (Fellow Employees, Ambiance of work place, Safety Measures, Administrative Workload, Teaching Workload), Compensation (Timely payment of salary and increments, Remuneration Satisfaction, Transparency in remuneration, Monetary incentives, Leave/Funding for research activity), Self Development opportunity (Advanced job training, Development of professional skills, Modern pedagogy approach) and Appraisal (Open appraisal, Timely redressed of problem, Transparent and fair system of feedback, performance evaluation, reward of good work, dealing with personal issues). The job satisfaction of employees is collective efforts of management and the faculty members say Mishra Sarika. [50]

Retaining such satisfied employees is a key challenge in front of management of private institutes. The success of any institute depends on attracting, developing, and retaining competent and qualified teaching staff. Beyond monetary quantification, such faculties need to be valued and trained. Such a satisfied and happy group of faculty will definitely lead the institute to the new heights. While an opposite action may hamper the institute badly. Dolly Lavina et al. proposed the methodology for retaining the talented faculty.[51]

Manoj Kumar also suggested the strategies for attracting, and retaining the best performing faculties such as recruitment and selection process, offering an attractive compensation package, creating best physical infrastructure, academic planning, work load, transparent performance appraisal system, faculty freedom and pro-active retention endeavors. [52]

In view of Dr. V.P.Gosavi, private institutes have increased in number, it is a fact that, maintaining expected quality and attracting meritorious students as well as faculty is a critical challenge in front of these institutes. Though the monitoring mechanisms and guidelines are provided by competent authorities, the attitude of management is not serious to comply with the lacunas and they adopt delay techniques. On an average 25% seats remains vacant in engineering institutions and may increase in future due

to negligence of the management, poor university result, poor campus placement, no effective teaching learning process and less attention on recruitment of qualified and sufficient number of teaching faculty. It is claimed that, if the management voluntarily and exactly follow the norms laid down by the universities, Government, AICTE, NBA, NAAC, it will have a positive effect on the problem of vacant seats.[53]

In the state of Maharashtra, the admission process for under graduate engineering courses is conducted through centralized admission system by the state government. Since the students get admission to a particular institute on the basis of marks obtained in the qualifying examination, Hemant Abhyankar et al suggested empirical probability factor for successful completion of under graduate course of engineering in four years on the basis of marks obtained in the qualifying examination.[54]

Pushkar Dubey studied, Factors affecting choice of Engineering Colleges in Odisha . He has administered structured 200 questionnaires with 27 different variables, to 200 students who came for the final choice of engineering college at 5 different nodal centers. A pilot study was under taken on 20 respondents to find out the adequacy of questionnaire. Five point scaling was used to rate 27 variables. Analysis of collected data was done by using factor analysis and reliability test .The analysis says following factors have highest priority.

Advertisement, Famous and experience faculty, Number and qualities of faculty, Good infrastructure, Location of the institution, communication facilities, fee structure, older institute, hostel and its facilities, good university results, Good track record of institution, branch result, Good overall teaching, Regular theory and laboratory classes are conducted. Variables with moderate priority are: Elder's suggestion, availability of branch of my choice, College nearer to home, extracurricular activities in the college. Less significant Variables are: Ragging history of the college, strict college administration, library facilities. [55]

Faculty shortage and quality of higher education are the two issues addressed by Chiranjibsen Sen in terms of 'demand and supply' of higher education services. The problem of faculty shortage and implementation of government policies are the key challenges in providing adequate quantity of higher education services and maintaining high quality.[56]

The problem of acute shortage of qualified and competent faculties /teachers is being witnessed at all levels , that to in most premier technical institutions in India, Majority of Institute are failing to meet the guidelines prescribed by the top regulatory bodies

viz UGC &AICTE. The paucity of qualified faculty is felt even more serious in professional and technical institutions. Due to increase in number of technical Institute and number of student studying , institutions are facing a faculty shortage to the extent of 67% all over the country. As per U N Rao committee in 2000-01,for engineering institutions total teachers required wear 60,970 (8,710 professors, 17,420 readers and 34,840 lecturers) with professional qualifications 26,130 Ph Ds and 34,840 M Techs.and available wear 5,862 Ph Ds and 11,035 MTech's ,which tends to shortfall of around 70 per cent .So one can imagine the quality of students being churned out due to such huge shortage.

It is because of inability of institutions to attract and retain qualified and trained faculty of high order, bureaucratic process. Apeejay Stya Education Research Foundation suggested providing autonomy to appoint competitive faculty and offer pay structure comparable with industry, to offer more allowances, freedom to undertake consultancy arrangements and avail of attractive perks such as housing facilities in case higher salaries are not possible. Flexibility in appointment, in age limit and qualification is necessary to ensure quality Faculty. [57]

The experiment conducted by Mike Elmore et al., Binghamton University, suggests that students must have an option of either attending a lecture or preparing through viewing a video recording of the lecture. This experiment concludes that these options do not affect negatively on students performance. [58]

About 86% engineering students takes education in Self financing private engineering colleges. Zakir Husain claims that student passing out from such colleges have poor quality of education due to the reasons viz, Lack of faculty, Poor learner quality, Rigid and obsolete curriculum, Dearth of R & D activities, Poor physical infrastructure etc. Solution to meet the future challenges could be financial incentives/support for setting up campuses of higher education with private or corporate organizations, to offer quality programmes at the less cost. fixation of fees should not be in control of state, Involvement of foreign partnership (FDI) in education, accreditation of courses [59]

2.2 Summary of Literature Survey

Researcher has studied the relevant literature and noted important finding with respect to following.

Meaning of quality and what is expected by quality in education. The present monitoring mechanisms for quality assurance viz. NAAC, NBA, University are studied. The outcome of implementation of TEQIP and its KPI are noted. Factors which affect quality of engineering education and present challenges faced by Institute, particularly those which are located in rural places are studied. These influencing factors are GER, govt. policies and its effect, unplanned growth of engineering Institute, availability of T-L process, shortage of qualified faculties/teachers, job satisfaction and retention of teachers, reasons for un-employability, expectation and commitment of all stakeholders to achieve excellence in education.

Use of TQM, ISO, Six Sigma, SWOT analysis, MCDM as tool to improve quality of education. The methods/ procedures to apply these tools for improving academics, research, administration, infrastructural facilities, university result, placement opportunities, expectation of all stakeholders and overall development of Institute.

How values, skill & knowledge (VSK) helps for preparing quality teachers particularly fresh teacher, Use of IUCEE (train the trainer), the necessary framework of professional learning based on pedagogy, training will contribute for improvement. Does classroom teaching is effective over all other methods, effect of student attendance in class, is studied.

Student feedback, its importance, reliability and outcome to improve quality of teaching and for measurement of performance of teacher is studied. Various attributes related to performance of teacher and its measurement, role of teacher, measurement of efficiency and effectiveness of teaching, the applicable APIs defined by UGC are studied.

Further the study contains the literature about what are the parameters to attract meritorious students to an institute during admission process and what are the prioritized influencing parameters considered by student while selecting a particular Institute at the time of admission?

Study indicates that job placement is the topmost parameter to identify quality Institute in addition to existence of Teaching-Learning process, availability of qualified and number of faculty, university result of Institute.

2.3 Gap Analysis in Literature Survey

In the country quality of technical education is monitored through AICTE, UGC, NAAC, and NBA. The overall literature review indicates that the guidelines or Key

Performance Indicators to assure quality are available for the institutes having age more than five years through mechanism of NAAC, NBA and the schemes like TEQIP. Researcher has studied NBA guidelines as mentioned in 2000 till 2010 manual for assessment of Institute. Institute becomes eligible for NAAC & NBA assessment after 2 batches are passed out. The infrastructure requirement is mandatory as per AICTE norms and also considered while establishing the institute without which Institute cannot get permission to function. No doubt, it is mandatory to follow all basic norms of NAAC and NBA, by the Institute. However all the norms may not be so important for newly started engineering institutions. It is to note that the criteria of assessment of institute by NBA have almost 70%weightage (700 marks out of 1000) for Teaching learning process, Human resource (faculty, student).Therefore its major concern that in what way newly established Institute will be strong enough for T-L process, and faculty, student aspect. It is observed as research gap that, no such guidelines or Key Performance Indicators (KPI) for newly established engineering institutes are available. During the literature review, the researcher has noted an important issue that the challenges / difficulties of newly established institutes that to again in rural area, are very much different than established ones.

The gap analysis shows following issues which are not addressed and need consideration:

1. Efforts required ensuring 100% admissions in newly established engineering institutes that to in rural area of Maharashtra.
2. Challenges in front of newly established engineering institute in rural area of Maharashtra.
3. Quality of aspiring candidates interested in teaching profession.
4. Training of teachers who have accepted teaching as profession and are new to the profession.
5. Identification of essential and desirable qualities that a teacher must possess.
6. Method to measure these qualities on scale and to define performance index of a teacher.
7. Monitoring mechanisms to ensure that effective teaching-learning takes place in a newly established engineering institute in rural area.

Chapter 3: Objectives and Hypotheses

3.1 Statement of the Research Problem

The students have a choice to join any institute in a State through a single window admission system. The students preferred to join such institutions which can offer jobs immediately on completion of their education. The industry (NASSCOM) feels that many engineers have a formal degree but do not satisfy their requirements for employability. To ensure the quality of technical education, the accreditation process have been defined and carried out by National Board of Accreditation (NBA) and National Assessment and Accreditation Council (NAAC). Many of these evaluation parameters for accreditation are applicable to the institutes which have completed at least five years. The challenge is to identify parameters for establishing and monitoring quality of education from the beginning of a newly established engineering institute. There is a need to look at the Teaching-Learning process which can impart adequate technical knowledge to the students to make them employable at the end of their program, especially with the newly established engineering institutes in the rural area.

On the other hand, managements of such institutes are facing many problems such as vacant seats , poor academic quality of students, shortage of faculty, attract and retain better teachers etc. It is observed that the effect of vacant seats is directly affects the economy of such private self financed institutes. Therefore management of such institutes is keen to resolve such issues. Statement of the Research Problem is based on these issues.

3.2 Objectives

The objectives of the research were defined as follows:

As university examination results are very important parameter to attract students while selecting a institute for admission,

1. Whether physical attendance of the students in a class room for theory classes helps them in university examinations?
2. Whether regular assessment of the subject knowledge acquired by the students is useful to improve their performance in the end semester university examination?

3. Whether student's academic feedback about a teacher can indicate the university result of the subjects taught by the teacher?

In order to carry out this study and make of relevant in all adversities the research design was made for rural institutes where the researcher can exercise necessary control over academic activities. Hence the following steps were undertaken:

a) Identify newly established (during 2010-11) engineering institute in a rural area for experimentation.
b) Identification and recruitment of teachers during 2011-12, 2012-13.
c) Induction training to the recruited teachers immediately after recruitment for improving measurable qualities.
d) Implement teaching-learning process and mechanism to monitor the process on continuous basis (follow best practices like lesson plans, notes, solution to past university examination papers, formation of question bank for regular assessment of students).
e) Conduct regular tests and give their results immediately.
f) Collect student's anonymous feedback about every teacher on fixed parameters to grade them.
g) Correlate the observations.
h) Analyze, conclude and suggest suitable model.

3.3 Definitions

As per UGC, Teacher is defined as a faculty/staff assigned the professional activities of instructing pupils, providing knowledge and giving guidance in the subject area of studies.[40]mhrd.gov.in/sites/upload_files/mhrd/files/ebook/ebook_files/annexures/Annexure-2.pdf

Teacher: As per Maharashtra university act 1994, Teacher means full-time approved professor, associate professor, assistant professor, reader, lecturer, in any affiliated or autonomous college. [14] www.unishivaji.ac.in/MUAct1994_040114.pdf

Qualified Teacher: One who has acquired minimum qualification as per norms of AICTE. [6]

Suitable Teacher/ Faculty:

The selection committee as per UGC/AICTE/University is constituted to select suitable teacher from amongst the qualified candidates. The selection committee may also find many qualified candidate as unsuitable for teaching position. As the

researcher has been often a part of selection committee, the term suitable teacher has been used.

Suitability is generally a common consensus of the selection committee about the individual perception of the members about a candidate in respect of minimum qualification as per norms of AICTE, good communication skills, fundamental knowledge, confidence etc.

Technical Education: AICTE includes Engineering, Management, Master of Computer Applications (MCA), Architecture, Pharmacy and Hotel Management education in technical education. The focus in this research is on engineering education.

Performance of a Teacher: Perception of the students based on academic performance.

Effective Teaching: The effectiveness is % of the students passing in a subject taught by the teacher.

Good Teacher/Faculty: An effective teacher, one who brings out better results.

Rural Area: As defined for the classification of the engineering institutes by the Director, Technical Education, Maharashtra State.

However researcher has also referred the definition of rural area is "In the rural areas the smallest area of habitation, viz., the village generally follows the limits of a revenue village that is recognized by the normal district administration. The revenue village need not necessarily be a single agglomeration of the habitations. But the revenue village has a definite surveyed boundary and each village is a separate administrative unit with separate village accounts. It may have one or more hamlets. The entire revenue village is one unit.

Reference:

http://censusindia.gov.in/Data_Products/Library/Indian_perceptive_link/Census_Terms_link/censusterms.html

Rural Urban Areas: In the Census of India 2011, the definition of urban area adopted is as follows: (a) All statutory places with a municipality, corporation, cantonment board or notified town area committee, etc. (b) A place satisfying the following three criteria simultaneously:

(i) a minimum population of 5,000

(ii) At least 75 per cent of male working population engaged in non-agricultural pursuits; and

(iii) a density of population of at least 400 per sq. km. (1,000 per sq. mile).

For identification of places which would qualify to be classified as 'urban' all villages, which, as per the 2001 Census had a population of 4,000 and above, a population density of 400 persons per sq. km. and having at least 75 per cent of male working population engaged in non-agricultural activity were considered. An area is considered 'Rural' if it is not classified as 'Urban' as per the above definition.[10]

In Maharashtra majority of self financed engineering colleges are located in metropolitan cities viz Mumbai, Pune, Nagpur or very close to such cities and these Institute derive all the benefits of metropolitan cities. The researcher has considered institutes as rural institute which is out of metropolitan cities, which do not get advantages of the city, as well as on the basis of their postal address. The identified institutes are in the smaller village under control of grampanchayat.

3.4 Hypotheses of Study

Hypotheses:

On the basis of objectives of the study and activities to be carried out for such a study, following hypotheses have been formed.

H1: Students' attendance in a class facilitates their performance in university examinations.

H2: Continuous assessment in terms of class test improves student's performance in their university examination.

H3: Performance Index of teachers has a positive correlation with student's performance in the university examination.

These hypotheses are to be tested with the data to be collected from selected rural institutes, after carrying out the steps mentioned earlier.

Chapter 4: Research Methodology

Introduction

This research is based on scientific method which has empirical verification as objective. The scientific method used has predictability and system as main characteristics, where results are predicted with sufficient accuracy by using designed procedures / system for systematic mode of investigation. The method of investigation is based on logical aspect because inferences drawn are on the basis of collected data. The data collected was through experimental observation.

4.1Basis for Research Methodology:

4.1.1 An Overview

The researcher, with 30 years of teaching experience, is working with an engineering institution, which is 30 years old, in the State of Maharashtra. Vishwakarma Institute of Technology, Pune (VIT,Pune) was established in 1983 by Bansilal Ramnath Agarwal Charitable Trust with 3 branches at UG level. Further the branches were expanded with 9 UG, 8 PG along with recognized PhD center for 6 disciplines as on date. The institute has received academic autonomy in 2008 by following rigorous process for autonomy. It is a first private, self financed technical institute who has received the academic autonomy in the state of Maharashtra. Students from Maharashtra as well as many other states in the country have studied engineering in VIT and nearly 400+ international students study in this Institute.

Thus VIT, Pune has established its brand value in Technical Education in India as well as abroad. The core competency of the institute is implementation of teaching learning process and dedicated faculty available. Therefore it is a tradition that meritorious students take admissions every year and no vacancy (at the time of admission) is recorded at any level (UG/PG) during the single window admission process in each year. The effect of this is seen at the time of campus placement as well as at the time of admissions for higher education abroad. It was possible mainly because of the qualified, dedicated good teachers with appreciable retention period of faculty and teaching learning processes designed and implemented. Faculty derived the freedom of work and job satisfaction at the work place due to policies

implemented by visionary management. Due to this many managements like to inculcate best practices adapted in VIT, Pune.

4.1.2 Faculty Recruitment Process:

Because of the existence of a strong brand, many qualified candidates are attracted for teaching positions in VIT, Pune and as the number of applicants is very large, compared to the positions available ,VIT, Pune has designed a specific recruitment process, within the framework of guidelines given by the UGC and University act.

The total process consists of five major stages:

1. Call of applications and scrutiny of applications to identify eligible candidates.
2. Conduction of objective type test based on fundamental knowledge and technical concept in respective domain on the lines of graduate aptitude test exam for engineers (GATE).
3. Short listing of candidates.
4. Classroom presentation on technical topic in the presence of a committee consisting of senior faculty.
5. Carry out interviews of these shortlisted candidates by selection committee constituted as per the norms, on the same day.
6. Appointment order / offer letter to selected candidates, on same day.

The time and period of recruitment is planned in such a way that newly joined faculty will be available well in advance before commencement of an academic year. After joining of these candidates, induction training is conducted and they are made aware about expectations of the management from them. The main focus of induction training is role of a teacher, effective teaching learning process, importance of student's feedback and monitoring mechanism used by the Institute.

4.1.3 Students Feedback Process:

The primary objective of conducting feedback is to understand the perception of the students about effectiveness of teaching a course/subject by a teacher. A well structured questionnaire which was evolved after consistent research is defined to know teachers performance from student's perspective, about teaching learning process. The frequency of conducting the feedback is twice in a semester for every subject and for every teacher. The analysis of feedback is conveyed to the respective teachers and if required they were counseled by Head of the department / Principal/ Director for further corrective actions. This has resulted in continuous improvement in teacher's academic performance. Every teacher's performance index (PI) at institute

level as well as department level is calculated and the best performing teachers (those who score above a bench mark) are appreciated with cash prize every year. This process is in place since 2002 till date. The outcome of this process has resulted in following activities:

1. Improvement in T-L process at all levels (UG & PG).
2. Weakness of teachers was identified, for mentoring of teacher.
3. Student's satisfaction level / and performance improved.
4. Better student got attracted.
5. Branding of Institute.

This branding, due to pure academic discipline and development attracted many managements to the Institute, for guidance to start and run new Institute and replicate "VIT-Model".

The brand name of the institute is result of the systems in place from many years(2000). Looking into these academic achievements, and branding, managements who wanted to start new institute in the state across different geographic locations and affiliated to different universities, have been approaching for academic alliance with the management of VIT, Pune to implement the same philosophy at their institute right from the beginning.

VIT, Pune made formal academic alliance with these newly started Institutes and started exercising control over teacher identification, teacher training, implementation of T-L and monitoring process. This gave the researcher an opportunity to get associated closely with T-L process and monitoring of these Institutes, to carry out further research.

4.1.4 The Identified Institute for academic alliance:

Identified Institute selected for study is owned by the respective management and having only academic alliance with Vishwakarma Institutes where by researcher could gain access to all Institutions.

Following engineering institutes made an academic alliance with VIT, Pune.

i. Sanjay Ghodawat Group of Institutes (2009) , Gate No. 583 to 585 , A/P. Atigre Taluka : Hatkanangale, Dist - Kolhapur, Hatkanangale, Maharashtra 416118
ii. Veerayatan Group of Institutes (2010) , Bhuj Mandvi Highway, Haripar, Dist. Kutch, Mandvi, Gujarat 370460

iii. Suman Ramesh Tulsiani Group of Institutes (2012), Old Pune-Mumbai Highway (NH-4), At Khamshet, Tal: Maval, Dist: Pune: 410405. Maharashtra

iv. Sandipani Group of Institutes (2011) , Kolpa, Nanded Rod, Latur 413512

v. College of Engineering (2011), Survey No.31(Part), Thakurki, Tal. Phaltan, Dist.Satara.

vi. Dnyanshree Institute Engineering and Technology (2012), A/p Sonvadi-Gajvadi, Sajjangad Road, Tal Satara, Dist. Satara.

vii. Manajiraje Bhosale Technical Campus (2012), Islampur-Sangli Road,Urun Islampur, Tal. Walwa Dist Sangli 415409 .

The researcher was involved in teacher identification, training of teacher, establishment of T-L process and monitoring the process for institute Sr. No. (ii) to(vii).

4.1.5 Requirements for Understanding:

The management of respective institute and single point of contact (SOP) from Vishwakarma Institutes has mutually agreed upon:

a) No compromise on recruitment of teacher to satisfy AICTE/DTE/University faculty norms about teacher student ratio.
b) Academic control shall remain with Vishwakarma Institutes.
c) Management of newly established institute shall provide mandatory infrastructural support as per AICTE/DTE/University norms which includes but not limited to funds, buildings, IT infrastructure, Laboratory equipments, transport facility to students, hostel, library, canteen etc.
d) Management of newly established institute shall proactively get involved in various motivational initiatives which are deemed to be necessary for betterment of institute and create healthy environment for the teachers to get job satisfaction and for students to make them proud to be an integral part of the institute.
e) The period of academic alliance shall be minimum for five years to observe results/ outcome of the teaching learning process implemented.

Although initially seven institutes were part of an academic alliance and proposed research work was started with these institutes by the researcher. In due course of time, the data collection was discontinued with four institutes because of:

i. Closure of institute
ii. Discontinuity of academic alliance

iii. Frequent change of teachers (change of job by teacher)

iv. Frequent change in class time table due to administrative problems, local constrains and unforeseen problems.

v. Reluctance to share data though it was committed by institute's management.

Therefore, the institutes which had continued with academic alliance were considered for further research work. The management of Vishwakarma Institutes was associated with these seven institutes which are located in rural locations in the State of Maharashtra, out of which two were established in 2011 ,three in 2012 and two before 2010. In all, more than five hundred teachers are currently employed in these institutions. The researcher was associated with his mentor who is a very senior academician in the field of engineering and technology. The mentor was entrusted with the responsibilities to recruit and train all the teachers to maintain academic standards, establish teaching learning process to ensure 100% admissions in the associated institutes. The researcher was fully involved in recruitment processes as well as conducting induction training program for all the teachers. These teachers are also available, for further interaction with the researcher. Induction training workshops were conducted for the entire new faculty recruited for the seven newly established institutes. These workshops and such workshops conducted in the earlier years, has formed the basis of hypothesis.

4.2 Research Methodology adopted by Researcher:

The research methodology consists of identification of newly established engineering institute, recruitment of teachers as per designed methodology, execution of induction program for recruited teachers as well as existing teacher if any, collecting the data about perceived qualities of teachers, identifying most important qualities of a teacher which would lead to a better teaching learning process (better results and employable as the outcome), segregating measurable characteristics from such qualities and then designing of a questionnaire for the feedback from the students, implement the feedback process and monitor performance index (PI) of a teacher on monthly basis to analyze relation between PI of teacher and university examination results at the end of semester / an academic year.

This process to be implemented at least 2-3 year in identified Institutes. Based on the outcome of this experimentation, suggest model to ensure effective T-L process and its monitoring which will enhance university result, number of admissions with quality student in Institute, ultimately leading to better job placement.

4.3 Type of Research

Out of four basic types (explanatory, conclusive, modeling, and algorithmic) of research, this research is of conclusive type with experimental type where researcher has studied effect of set of certain factors on the response / outcome. The proposed research was based on quantified facts for examining and hypothesis testing. Therefore it can categorize as quantitative research. Further research is based on evaluating the outcomes due to implementation of certain policies, plans over a period of two-three years for teaching learning process; researcher claims that it is a evaluation research type. The quantified facts and data collected were for three institute / organization so it becomes a part of case study.

4.4 Research Design

The selection of research approach was conclusive with experimental type.

4.5 Primary Data

This data is collected through ethnography and original in nature. This data is collected through technical tests conducted for recruitment, interaction in induction training for recruited teachers, academic feedback received from the students over the period of three years. Further primary data is collected by distributing/on line, the feedback questionnaire & getting it filled by the students. The primary data of academic performance of 100% students on roll is considered for experimentation viz. attendance, class test, and university results. For this purpose, manual method was used.

4.6 Sample Design

4.6.1 Sampling frame of population:

The researcher has studied and derived the statistical information regarding number of UG engineering institute available in the state since 1854 to 2014 from official website www.dtemaharashtra.gov.in and admission information brochure 2014-15 published by Directorate of Technical Education, Maharashtra. Table 4.1 shows that majority of the institute were started from 2000 onward. Total engineering institutes which are offering UG courses in Maharashtra up to 2014, were 376.

Table 4.1 Number of Engineering Institutes region wise

Sr.No.	Region	Upto 1982	1983-1984	1985-1990	1991-1999	2000-2009	2010-2014	Total
1	Amravati	01	05	01	03	12	08	30
2	Aurangabad	02	07	01	02	13	09	34
3	Mumbai	03	07	06	19	21	14	70
4	Nagpur	01	06	02	07	34	07	57
5	Nasik	00	10	00	08	17	15	50
6	Pune	04	12	02	15	51	51	135
	Total	11	47	12	54	148	104	376

Source: www.dtemaharashtra.gov.in

Classification of institute as rural, urban is as per information available on website. Out of 376 institutes, 169 are in rural, 162 in urban and 45 are located in semi urban as shown in table 4.2. There are some institute from Pune, Mumbai ,Nagpur which are very close to city/ and or presently in Municipal corporation and gets all benefits of city, such institute are classified by researcher as semi urban .These institute are not considered as rural for further study.

Table 4.2 Number of Engineering Institutes in Urban, semi urban and rural area

Sr.No.	Region	Urban	Semi Urban	Rural	Total
1	Amravati	10	00	20	30
2	Aurangabad	18	00	16	34
3	Mumbai	45	03	22	70
4	Nagpur	22	16	19	57
5	Nasik	11	06	33	50
6	Pune	56	20	59	135
	Total	162	45	169	376

Source: www.dtemaharashtra.gov.in

Table 4.3 shows region wise rural institute and the duration in which they are established. Up to 2009 total institutes were 272 which include 110 in rural and 162 in urban + semi urban area.

Table 4.3 Number of Engineering Institutes in rural area

Sr.No.	Region	Upto 1982	1983-1984	1985-1990	1991-1999	2000-2009	2010-2014	Total
1	Amravati	00	03	00	02	08	07	20
2	Aurangabad	00	03	00	01	08	04	16
3	Mumbai	00	01	01	04	09	07	22
4	Nagpur	00	01	02	01	13	02	19
5	Nasik	00	08	00	05	10	10	33
6	Pune	01	03	01	03	22	29	59
	Total	01	19	04	16	70	59	169

Source: www.dtemaharashtra.gov.in

During 2010 to 2014 total institute were 104 out of which 59 in rural and 45 in urban/semi urban area. Table 4.4 depicts the detail break up of these institutes year wise.

Table 4.4 Breakup of institute during 2010-14

		Year														
Sr. No	Region	2010			2011			2012			2013			2014		
		U	UR	R	U	UR	R	U	UR	R	U	UR	R	U	UR	R
1	Amravati	0	0	3	1	0	2	0	0	0	0	0	1	0	0	1
2	Aurangabad	2	0	2	1	0	2	1	0	0	1	0	0	0	0	0
3	Mumbai	2	0	1	1	1	3	0	1	1	0	0	2	2	0	0
4	Nagpur	4	1	2	0	0	0	0	0	0	0	0	0	0	0	0
5	Nasik	1	1	1	1	0	5	0	1	4	1	0	0	0	0	0
6	Pune	4	3	10	5	4	9	2	1	8	0	0	1	3	0	1
	Total	13	5	**19**	9	5	**21**	3	3	**13**	2	0	4	5	0	2

Source: www.dtemaharashtra.gov.in

As the study is limited for the period of year 2010 to 2014, the process of identification of institutes was started in year 2011-12, so that proposed experimentation could be executed for another 2 years to observe outcome.

Hence the population was defined with 21(in 2011) rural institutes. Out of which 5 institutes were identified as sample from geographically different location across state of Maharashtra.

Researcher has started collecting the data from such 5 identified institutes. In order to monitor the performance of teacher and student, consistency of collected data over the period of at least for 2 year, was one of the essential components of research work. Due to unavoidable reasons as mentioned in 4.1.5(Requirements for Understanding), it was possible to continue only with 3 institute out of 5.

4.6.2 Sample design for Teacher and Students of newly established institutes:

The researcher has selected teachers and students from three institutes in rural area identified through non probability sampling method, convenience sampling and purposive / judgment sampling. The rationale behind identifying these institutes is,

- All the institutes are engineering institutes approved by AICTE, New Delhi.
- Affiliated to different universities due to different geographical area.
- Institutes are offering same branches like Civil Engg., Computer. Engg., Mech. Engg., and E&TC Engineering.
- Functioning academic year is same i.e. 2012
- Self Financed Private Institutes
- Following same working culture although management and trust of these institutes is different.

4.7 Recruitment of Teachers

For recruitment of teachers, the traditional method to advertise the posts in the leading news papers was adopted. The applications were invited and scrutinized as per the university norms. The shortlisted candidates were called for a written test which was exclusively designed based on GATE (Graduate Aptitude Test in Engineering) examination. Further, successful candidates in the examination were called for a classroom presentation followed by technical and personal interview. The candidates with satisfactory performance in above mentioned process were appointed as a teacher.

4.8 Induction Training

In order to enhance understanding of the fresh teachers and to carry out their induction training, the researcher has conducted induction training programs for such teachers at several institutions, spread over various locations in the geographical area in the State of Maharashtra.

During the three / four day's induction training, the groups were formed with random selection. The following questions / activities were posed to the participating teachers:

1. What is a meaning of induction training?
2. How many of you have studied UG/PG from the college which is far away from this place?
3. What would you like to be in next five years?
4. Why have you joined teaching profession?
5. Why have you joined this institute?
6. Do you remember any of your teachers who taught you during your studies? If yes, why do you remember him/her?
7. What do you mean by teacher?
8. What do you understand by quality?
9. What is teacher's perception about quality in education?
10. What are the essential and desirable qualities of good teacher?
11. What could be the minimum common qualities that all teachers of our institute must possess to get good university result? (Group Activity)
12. According to you, who will test these qualities of teacher
13. Are these qualities measurable and how are you going to measure it?
14. What are ethical values to be adopted in the teaching profession?
15. What are teacher's expectation / perception about students?
16. Perform individual SWOT (Strengths, Weakness, Opportunities, and Threats) Analysis. (Individual Activity)

In response to the two days workshop at various locations, the answers were collected and analyzed.

Table 4.5 Interaction during Induction Training

Que.	What is a meaning of induction training?
Ans.	Understand institute's culture, Organization's structure , various systems of organization/ department, knowing the collogues, policies, rules and regulations of the institute, communication systems, to reduce the initial anxiety of newly joined faculty feel in a new institute, to familiarize the new faculty with the nature of job, people, work-place, work environment and the management
Que.	How many of you have studied UG/PG from the college which is far away from this place?
Ans.	Here the objective is to find spectrum of teachers from geographical area.

Que.	What would you like to be in next five years?
Ans.	Objective is to understand what the ambitions/plans of their career are. The answers were to become administrator, entrepreneur, teacher, researcher, complete PhD and so on..
Que.	Why have you joined teaching profession?
Ans.	To get satisfaction, they like teaching, self improvement and earning, to do something for community, passion, student's development, knowledge improvement, to do research, plenty of free time available, to do business, hobby, interest in teaching, remain connected with student and people, develop our own country, preserve character in life, get respect, noble profession, safe and secured for female, no other job in hand…
Que.	Why have you joined this institute?
Ans.	Brand name, good university results, nearby my residence place, placement record, recognized institute, regular and good salary, regular increments, acceptable policies, constraint of family, teaching techniques are good, safe and secure location, low living index, good facilities in the institute, working systems, scope for self-development , supportive and healthy environment, better opportunity…
Que.	Do you remember any of your teachers who taught you during your studies? If yes, why do you remember him/her?
Ans.	Good human being, communication skills, teaching style, conceptual explanation, interesting lectures, helpful in nature, punctuality, excellent knowledge, friendly nature, well disciplined, dressing sense, strict, punishment given, teaching with real time examples and its correlations, a person who changed my life, overall personality, a philosopher, use of understandable/ local language, impressive, unbiased…
Que.	What do you understand by quality?
Ans.	Fitness for the purpose, conformance to the requirement, degree especially high degree of goodness and worth as per oxford dictionary…
Que.	What is teacher's perception about quality in education?
Ans.	Teach the student in such a way that student remember/ understand what you want to remember by them is a quality of teaching.
Que.	What are the essential and desirable qualities of good teacher?
Ans.	**Essential :** Qualified, Good academic background, role model to student, command on subject, Interactive, conceptual, audible, knowledgeable, punctual, self confident, well prepared, faith in teaching, motivator, positive attitude, ability to make subject interesting, time management, impartial, active, honest , good listener, communication skills, understandable handwriting, command in class, use of effective methods to remove fear of subject, dedicated, takes care of job placement , counselor, devoted and visionary, ready to accept change, available to students, loyal, forgiveness in nature, parental care, good communicator, good in pedagogy, **Desirable :** focused, updated, clean character, polite, friendly, gives real

	time examples, disciplined, solution provider, actor, sense of humor, initiator, physical fitness, good reader, record keeping, involves students in productive work, conversant with teaching aids, spiritual, dressing sense, supportive to the students, helpful, researcher, hardworking, administrator, respect others feelings, planner, industrial experience, good judgment, inter disciplinary approach, qualification improvement, responsible, learner, maintain hierarchy, knowledge about country, tolerance, good leader, understanding of problems of the student, implementation of ideas through projects, happy personality, innovator, social person, well appraised on current affairs. . .
Que.	What could be the minimum common qualities that all teachers of our institute must possess to get good university result?
Ans.	Priority wise common qualities of teacher identified through group activity - Technical excellence/ subject knowledge - Teaching Skills/ Communication skills - Good Student - Punctual and Regular - Impartial/ Unbiased - Creative/ Innovative - Inspiring/ Motivating - Administrator - Character - Friend/ Philosopher/ Guide
Que.	According to you who will test these qualities of teacher?
Ans.	Management, Head of the Department, Peer, Self Evaluation, Students, Third party evaluation. Majority of the participants said – student's feedback.
Que.	Are these qualities measurable and how are you going to measure it?
Ans.	After the question realized by the participants , the participants changed/modified the quality parameters as follows : - Subject Knowledge - Correlate real time examples - Well Prepared - Communication Skills - Clarity of presentation - Interactive - Control over the class - Availability of teacher outside the lecture hours - Regularity and Punctuality - Demand of same teacher for next semester

And the induction training concluded with expectations of management from teachers and vice versa.

The outcome of the induction program was, the participant have clearly understood their role as a teacher in the development of the institute. They are focused to become a good teacher by inculcating the identified and expected quality parameters of a teacher.

4.9 Key Performance Indicators (KPI)

Following are the Key Performance Indicators (KPI) to monitor the academic progress of an institution.

1. Lecture schedule – The Head of the Institute (HOI) is expected to issue a time table to all the students and staff right from the commencement of the semester. HOI is expected to keep track of number of lectures scheduled against actually engaged on a daily basis per class and on weekly basis per subject, course, staff and class.

2. Attendance – The HOI will organize to record the attendance of all the students attending lectures / practicals / term work. The record of the attendance for each subject and for every student is to be maintained on a daily, weekly and monthly basis.

3. Lesson plans – All the faculty teaching various subjects / practicals / term work are supposed to prepare, submit and announce their lesson plan for the course work at the commencement of each semester. The HOI will organize to receive the success in terms of percentage of completion of the lesson plans for the individual subject and faculty on a weekly as well as monthly basis.

4. Question bank – The teachers are supposed to go through the University examination question papers for the previous semesters and prepare a question bank on similar lines for every topic in the curriculum of the particular subject. A one hour written test shall be conducted for every subject on a monthly basis and question bank for each examination be separately handed over to the students at the beginning of each semester.

5. Result analysis – After the completion of a semester and when the results of the previous university examinations are available, then, percentage result per course, per faculty, should be prepared.

6. Students' feedback – The performance evaluation of all faculties by the students will be considered as a mandatory requirement for all theory subjects. It should be carried out at the end of each month / four week period.

The evaluation of performance of teacher is based on the above Key Performance Indicator s (KPI) through mechanism of feedback given by students on structured and close ended questions.

4.10 Questionnaire for Students Feedback

In order to create more understanding amongst teachers and learners and to offer an opportunity for improvement in the teaching learning process to the teachers, a feedback form was developed with closed ended questions of both the types where respondent have to select one from given multiple choice and questions with rating scale, to seek feedback from all the students about measurable qualities / parameters of teaching of every individual teacher. The feedback sessions were conducted at the end of every four weeks of teaching, i.e. minimum two or three times in a semester.

Following are the points on which this appraisal was carried out, either in hard or soft form. The students have to choose one of the options for each parameter monitored like Good (5) / Average (3) / Poor (1).

a. Knowledge
b. Regularity
c. Punctuality
d. Communication skill
e. Presentation on blackboard.
f. Interaction during the class.
g. Effective communication for better understanding of the students.
h. Satisfactory completion of lessons planned.

The format implemented is as follows:

Name of the Institute:

Name of the Faculty :	
Name of the course (Theory/ Practical/ Term work) :	
Class & Division:	Date :

Note: Rational for the feedback: Dear students, this feedback would allow a teacher to consider your suggestions and make necessary improvements in his/her teaching, if required. It will encourage better teachers to become the best. It is necessary that every student should give his/her opinion, here below, without any prejudice. Please respond to all the points by putting a tick mark to the appropriate option below.

Sr.No.	Weightage→ Question ↓	5	3	1
Q.1	Has the teacher given you	Yes	No	Don't Know

	the lesson plan for the entire semester in the first week of teaching?			
Q.2	Has the teacher given you question bank for the forthcoming class-test, in advance?	Yes	No	Don't Know
Q.3	Does the teacher conduct the class exactly as per the time table?	Always	Many times	Sometimes
Q.4	Does the teacher engage all classes regularly?	Always	Many times	Sometimes
Q.5	How is the handwriting / drawing of the teacher on the blackboard?	Good	Average	Poor
Q.6	Does the teacher interact with you in the class?	Always	Many times	Sometimes
Q.7	Is the teacher audible in the class?	Very much	OK	Poor
Q.8	Does the teacher explain the concepts to you properly?	Always	Many times	Sometimes
Q.9	Has the teacher completed lessons as per the plan given to you?	Yes	No	Don't Know
Q.10	How do you rate his / her teaching?	Good	Average	Poor

A student is free to make any comment here:

_____

_____

… End of the format …

4.11 Procedure for calculation of Performance Index (PI) : for individual teacher for a particular subject for a particular division

Performance Index is to be determined for every question separately and average of all ten questions will be the overall Performance Index of the teacher for that particular class and subject.

Performance Index is calculated as follows:

$$PI = \frac{\sum 5x + 3y + 1z + 0r}{5(Strength\ of\ Class\ or\ Students\ on\ roll)} X\ 100$$

Where ‘x’ is a no. of students who have said (ticked) ‘yes/good’ (5 marks),
‘y’ is a no. of students who have ticked ‘No/Average’ (3 marks),
‘z’ is a no. of students who have ticked ‘Don’t know/poor’ (1 mark),
‘r’ is a no. of students who were absent at the time of feedback (0 Mark)

4.12 Academic Performance monitoring of students

The students are monitored through following parameters:

a) Classroom Attendance: A class teacher is appointed for every class / division. All the teachers teaching that class submits the attendance record at the end of the month to the class teacher. The compiled record of a class is displayed on notice board in consultation with the head of the department. The class teacher identifies the irregular students and asks for the reason. At the same time the absenteeism is informed to their parents and invites them on the campus in case of serious reason. The role of class teacher is to counsel the student and parents. This process is carried out throughout the semester.
b) Class Test / Online Test: A class test / online test is conducted twice or thrice in a semester for each subject and the performance is monitored individually.
c) University Examination: The performance of individual student for all subjects is complied and monitored after the declaration of the University Result.

4.13 Correlation of Performance Index of teacher and Academic Performance of student.

After the compilation of university results, the performance index of a teacher for respective subject is attached to evaluate the performance of a teacher in the respective subject. This exercise is carried out to find the impact of performance index on attendance, class test and university result.

This procedure is carried out for the first year and the second year engineering classes/divisions at two institutes, geographically located at different locations and different affiliating university. The 100% students’ data was collected for the two consecutive years (4 semesters) in institute A and 3 years (6 semesters) in institute B.

4.14 Secondary Data

Secondary data is used to study the perspective of various authors, reputed and controlling Govt. authorities like AICTE to understand the growth of technical

education as well as norms and standards to establish the institutes, NAAC and NBA to understand parameters of quality for established institute and individual program, NPIU for understanding impact of implementation of TEQIP project and associated Key Performance Indicators (KPI), DTE and Maharashtra University Act for understanding the processes and systems defined, NASSCOM for understanding the employability issues and the concern of industry, reports of Central and State Government on quality of technical education, and higher education.

Chapter 5: Data Collection, Analysis and Interpretation

Introduction

The objective of this research is to establish and maintain parameters of quality from day one, of the newly established engineering institute, with an exclusive focus on teaching-learning process and zero vacancy at the time of admissions.

The data collected is reliable and authentic since the researcher was involved full time, in establishment of the identified institutes and has implemented the processes viz. recruitment, induction training, and student's feedback. Also researcher was responsible for framing academic policies and monitoring academic matters of the institutes.

5.1 Data Collection

5.1.1 Vacancy Position

A Vacancy Position in Technical education

The information regarding number of technical institute and student admitted against sanctioned intake in the year 2012-13 was recorded. And the district wise vacancy positions was calculated on the basis of the document published by DTE named "Perspective Plan for Technical Education in Maharashtra State" in October 2012 on its official website.

In table 5.1 shows number of Technical Institute with intake, number of admissions, and vacancy in the AY2012-13.Technical Program includes: Engineering (UG+PG+Diploma),Pharmacy (UG+PG+Diploma), Architecture (UG+PG+Diploma), MCA, MBA, MMS, PGDM, Hotel Management etc

Table 5.1 Vacancy Position in Technical Programs offered in Maharashtra

Sr.No.	Dist	No. of Instt.	Intake	Admitted	% Vacancy
1	Aurangabad	60	15502	11058	29
2	Jalna	10	2028	1428	30
3	Nashik	86	21168	18345	13
4	Jalgaon	49	12474	9459	24
5	Ahemadnagar	62	16691	11640	30
6	Nandurbar	13	2322	1873	19
7	Dhule	24	5226	4116	21
8	Buldhana	19	5242	4113	22
9	Akola	9	1906	1464	23

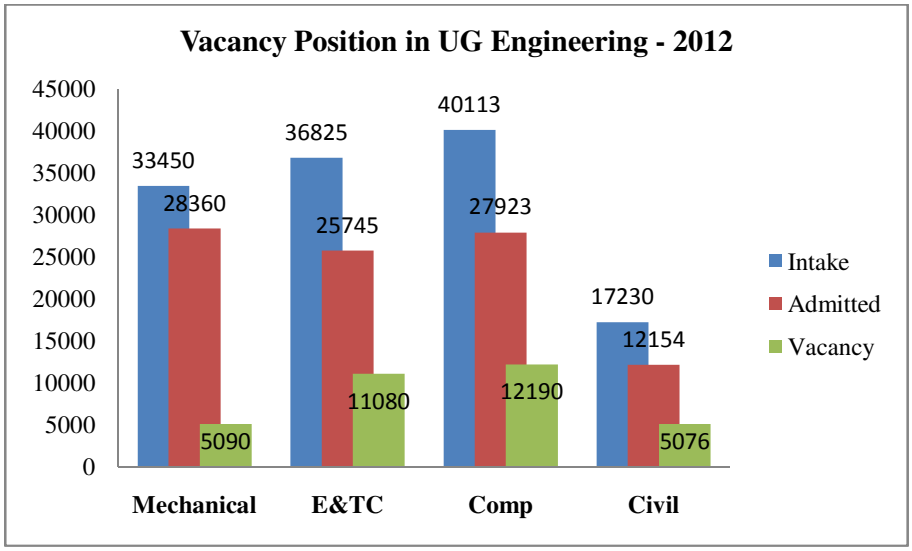
10	Washim	7	1740	831	52
11	Amravati	36	9863	8696	12
12	Yavatmal	21	5288	3859	27
13	Vardha	30	7556	5172	32
14	Nagpur	137	39072	27542	30
15	Bhandara	13	2665	2131	20
16	Gondiya	13	2338	1867	20
17	Chandrapur	22	6089	5077	17
18	Gadchiroli	2	600	475	21
19	Parbhani	13	2972	1793	40
20	Hingoli	5	1278	655	49
21	Beed	22	4848	3373	30
22	Nanded	26	6427	5070	21
23	Osmanabad	15	3040	1948	36
24	Latur	34	6458	4959	23
25	Pune	321	81661	62110	24
26	Satara	54	13321	8915	33
27	Sangli	37	11182	9103	19
28	Solapur	55	15362	11220	27
29	Kolhapur	49	15834	13744	13
30	Mumbai	109	24808	20208	19
31	Thane	55	12022	9969	17
32	Raigad	85	24037	19564	19
33	Ratnagiti	16	3586	3011	16
34	Sindhudurg	5	1400	922	34
	Total	1514	386006	295710	25

Source: http://www.dtemaharashtra.gov.in

It has been observed that on an average 25% seats are remaining vacant irrespective of program, location (urban / rural) and region. The further statistics says that, the institutes affiliated to Pune University and Mumbai University and belongs to urban have less vacancy as compared to other region. This is not a satisfactory situation.

B Vacancy Position in UG Engineering

Researcher has collected the information for four specific groups of branches viz Mechanical, Electronics and Telecommication, Computer, and Civil engineering since the same branches are available in indentified institute for research. Graph 5.1 shows the status of sanctioned intake, student admitted and vacancy position in 2012-13.



Graph 5.1 Vacancy Position in UG engineering. *Ref: Annexure 4*

The statistical information (Annexure 4) and graph 5.1 shows that considerable seats remained vacant in 2012-13 almost in all branches of engineering. This leads to serious interrogation since it is affective on economic aspects of the institute. Managements of self financed private institutes are worried to get admissions/students in their institute.

5.1.2 Intake Quality in selected institutes in rural area of Maharashtra

The students have a choice to join any institute in a State through a single window system. DTE performs the admission process and allocate students to all the institutes on the basis of merit and choice given by the students. It results into the top meritorious students getting the institute of high rank. It is observed that the newly started institutes are getting low performing students or the seats are remaining vacant since students do not prefer the institute.

Normally during admission period the information regarding cutoff of each branch in institute and number of student admitted in Institute against sanctioned intake is made available by DTE and same was noted

The cut-off shown below depicts the scenario of 4 identified newly started institutes in rural area as compared to the Government Institutes available in the respective affiliating university where newly started institutes are located.

Table 5.2 Cut Off Round I: First Year Engineering

Branch	2012-13		2014-15		2015-16	
	Institute		Institute		Institute	
	A	SGGS Nanded	A	SGGS Nanded	A	SGGS Nanded
Civil	58	129	25.22	90.8	24.82	92.57
Computer	45	132	--	91.5	--	93.18
E&Tc	58	141	--	90.78	--	89.68
Mechanical	70	147	25.03	95.66	34.1	95.83
Branch	**B**	**COE Avasari**	**B**	**COE Avasari**	**B**	**COE Avasari**
Civil	60	103	37.65	84.4	25.49	86.66
Computer	49	111	29.59	85.13	35.99	87.01
E&Tc	--	110	--	80.57	--	79.26
Mechanical	72	132	35.91	91.76	25.93	91.66
Branch	**C**	**WCE Sangli**	**C**	**WCE Sangli**	**C**	**WCE Sangli**
Civil	--	153	27.37	96.13	4.27	96.13
Computer		153	20.03	96.36	--	96.36
E&Tc		160	--	95.36	--	95.36
Mechanical		173	29.33	98.13	31.25	98.13
Branch	**D**	**WCE Sangli**	**D**	**WCE Sangi**	**D**	**WCE Sangli**
Civil	54	153	--	96.13	--	96.13
Computer	45	153	17.73	96.36	--	96.36
E&Tc	52	160	--	95.36	--	95.36
Mechanical	66	173	22.73	98.13	18.49	98.13

(--) means, students are not allocated to the institute in the respective academic year

Source: http://www.dtemaharashtra.gov.in

Government conducts a conmen entrance exam like CET/JEE/AIEEE and offers admission on the basis of merit. It is very much clear from above table 5.2 , that in 4 institutes which were identified for research, the performance of student at entry level exam is poor. Student of high level merit gets admission in Govt, or well established institute in city area. In addition to this, not a single student is allocated in such rural institute at first round.

Also as per rule, lateral admissions are offered to the students who have completed Diploma, at second year in degree engineering. Such diploma holder student gets admission in respective branch, based on the merit he/she has obtained at the time of completion of diploma. Table 5.3 shows status of admission and the merit.

Table 5.3 Cut Off Round I : Direct Second Year (Diploma students)

	Institute 2012-13		Institute 2014-15		Institute 2015-16	
Branch	**A**	**SGGS Nanded**	**A**	**SGGS Nanded**	**A**	**SGGS Nanded**
Civil	64.06	79.66	72.45	88.4	68.3	87.56
Computer	61.16	82	63.16	86.44	60.65	85.88
E&Tc	50.85	87.77	64.4	90.11	64.65	88.12
Mechanical	64	--	68.12	89.65	61.61	89.94
Branch	**B**	**COE Avasari**	**B**	**COE Avasari**	**B**	**COE Avasari**
Civil	--	86.13	63.55	91.44	51.21	88.18
Computer		85.1	60.52	No Seat	60	86.88
E&Tc		88	53.54	No Seat	68.41	87.35
Mechanical		87.52	64.78	90.2	63.24	89.13
Branch	**C**	**WCE Sangli**	**C**	**WCE Sangli**	**C**	**WCE Sangli**
Civil	--	88.51	61.63	No Seat	64.55	91.25
Computer		87.1	61.23	No Seat	49.64	90.75
E&Tc		89.77	66.57	93.6	49.54	92.63
Mechanical		90.57	72.24	92.6	54.67	92.19
Branch	**D**	**WCE Sangli**	**D**	**WCE Sangli**	**D**	**WCE Sangli**
Civil	67.81	88.51	54.72	No Seat	61.09	91.25
Computer	55.59	87.1	58.23	No Seat	61.31	90.75
E&Tc	86.97	89.77	80.5	93.6	62.06	92.63
Mechanical	67.22	90.57	79.34	92.6	60.35	92.19

(--) means, students are not allocated to the institute in the respective academic year

Source: http://www.dtemaharashtra.gov.in

5.1.3 Projected Shortage of Faculty up to 2018

As the intake capacity and number of institutions are increasing in the state of Maharashtra, the challenge in front of these institutes is to recruit qualified faculty as per AICTE norms. In continuation with reference to point 1.11 Profile of Maharashtra state Table 1.5, Increase in intake capacity of Technical Education in Maharashtra, by assuming (Base Year 1978) that all institutes will have 100% admissions and 100% passing of students from all the courses, the researcher has predicted that cumulative number of available technical manpower will be 114947 post graduates, 1544798 under graduates and 1447314 diploma holders at the end of 2018. The source for getting teachers to teach engineering courses will be only those

who have passed post graduation (ME/M.Tech). Such manpower (Projected shortage of Faculty in Maharashtra) is predicted as mentioned in table 5.4 .

Table 5.4 Projected shortage of Faculty in Maharashtra

	ME		BE		Diploma		Total	ME	ME available	Projected
	Students	Faculty	Students	Faculty	Students	Faculty	Faculty	100%	for Teaching	Shortage
Year	Strength	Required	Strength	Required	Strength	Required	Required	Pass out	70%	of Faculty
2010	15457	1288	253243	16883	270002	13500	31671	29496	20647	-11024
2011	18749	1562	321186	21412	333949	16697	39672	32285	22600	-17073
2012	22041	1837	389129	25942	397896	19895	47673	38366	26856	-20817
2013	25333	2111	457072	30471	397896	19895	52477	44447	31113	-21364
2014	38698	3225	506699	33780	447176	22359	59364	50528	35370	-23994
2015	52063	4339	556326	37088	496456	24823	66250	56609	39626	-26623
2016	65428	5452	605953	40397	545736	27287	73136	76055	53239	-19898
2017	78793	6566	655580	43705	545736	27287	77558	95501	66851	-10708
2018	92158	7680	655580	43705	545736	27287	78672	114947	80463	1791

The prediction is based on the following assumptions:

- 100% admissions against sanctioned intake at ME/M.Tech .
- 100% passing - All admitted students will pass the course in two years.
- No increase in intake capacity for ME/M.Tech from 2014 onwards.
- It is safe to assume that only 70% students will be interested and available to join teaching profession.
- Out of 70%, with an assumption that conversion ratio (1:5), 15 to 20 % will be appropriate, suitable candidate for effective teaching.

From the predictions, it is clear that noticeable shortage of teachers will remain as a fact till 2017 and the scenario may be slightly better from 2018 onwards.

5.1.4 Teacher Recruitment Process

From the previous research and literature review, various report published by government time to time, and by the researcher as mentioned in 5.1.3, it is very much convinced that shortage of faculty exists. Especially it is more serious in newly established rural engineering institute. Due to this recruitment of teacher, training of teacher becomes a continuous process.

For recruitment of teachers, the traditional method was adopted to advertise the posts in the leading news papers. The applications were invited and scrutinized as per the university norms. The shortlisted candidates were called for the written test which was exclusively designed based on GATE (Graduate Aptitude Test in Engineering) examination. Further successful candidates in the examination were called for classroom presentation followed by a technical and personal interview. The process was carried out in the month of April of respective year for all five identified institute. The data of 2 institutes was available but not proper and consistent, hence data of three identified institutes (A, B, C) for consecutive two academic years – 2014-15 and 2015-16 is presented in this thesis.

Table 5. 5 No. of applications scrutinized and processed for written test – At a glance

AY	Institute	Branch				Total
		Civil	Mech	E&TC	Comp	
2014-15	A	22	40	15	17	94
2014-15	B	07	27	39	22	95
2014-15	C	08	34	50	54	146
2015-16	A	20	31	16	15	82
2015-16	B	12	22	43	28	105
2015-16	C	13	74	75	58	220
Total		82	228	238	194	742

Source: *Collected by researcher from identified institute*

Table 5. 6 No. of Candidates appeared for Written Test (Institute Wise)

Institute	Qualification			Total
	ME	ME (Pursuing)	BE	
Instt. A	62	35	79	176
Instt. B	48	71	81	200
Instt. C	67	165	134	366
Total	177	271	294	742

Table 5. 7 No. of Candidates appeared for Written Test (Year Wise)

Year	Qualification			Total
	ME	ME (Pursuing)	BE	
2014-15	64	121	150	335
2015-16	113	150	144	407
Total	177	271	294	742

Table 5. 8 Branch wise performance of Written Test for AY 2014-15& 2015-16

Branch	Marks Obtained (Out of 100)					Total
	<30	31-40	41-50	51-60	>61	
Civil Engg.	4	18	29	23	8	82
Comp. Engg.	71	74	42	5	2	194
E&TC Engg.	49	87	70	28	4	238
Mech. Engg.	21	41	83	57	26	228
Total	145	220	145	113	40	742

Table 5. 9 Branch wise Teaching Experience of applicants for AY 2014-15& 2015-16

Branch	Experience in Years			Total
	0-1 Year	1-3 Years	3-5 Years	
Civil Engg.	50	22	10	82
Comp. Engg.	132	42	20	194
E&TC Engg.	129	53	56	238
Mech. Engg.	118	61	49	228
Total	429	178	135	742

5.1.5 Induction Training

Since the selected candidates in the recruitment process are majority fresh and have less experience, the researcher has conducted a three days induction training programs for such teachers at several institutions, spread over various locations in the geographical area in the State of Maharashtra. Groups were randomly formed and they were asked to identify and evolve ten important qualities, which every teacher must possess and they are from amongst the ones listed below:

Confident, Understanding, Knowledgeable, Inspiring, Generating interest, Punctuality, Should understand his own mistakes, Neatness, Body language, Communication skills, Imagination, Responsible behavior, Patient, Well prepared, Good planner, Will to teach, Dedication, Friendly, Devotion, Logical thinking, Regularity, Discipline, Good Reader, Character, Polite, Hardworking, Eagar to learn new things, Result Oriented, Motivator, Impartial, Helper, Social, Leadership, Good Listener, Mentor, Good guide / counselor, Ethical, Spiritual, Pleasant personality, Interactive, Honest, Frank, Caring, Innovative, Humorous, Cheerful, Lovable Person, Positive attitude, Adaptive, Flexible, Visionary, Student Centric. The teacher participants were then asked individually, to rank ten important qualities / parameters to ensure better teaching-learning process.

Further the group activity was carried out to prioritize measurable parameters out of the listed characteristics. The characteristics emerged were as follows: Knowledge, Communication Skills, Punctuality, Regularity, Discipline, Friendly Behavior, Innovative, Positive Attitude, Student Centric, Researcher, Devoted, Motivator, Impartial, Sincere, Honest, etc.

Further the list was unanimously updated to such parameters which are measurable and the final list consists of :

a. Knowledge.
b. Regularity.
c. Punctuality.
d. Communication skill.
e. Presentation on blackboard.
f. Interaction during the class.
g. Effective communication for better understanding of the students.
h. Satisfactory completion of lessons planned.

5.1.6 Number of Students participated in Academic Feedback

Based on the measurable parameters identified, the academic feedback form was designed and circulated amongst the students in the institutes. Here the students of first year (FE) and second year (SE) are considered for feedback analysis. Every semester contains five theory courses for which the feedback was conducted individually. The feedback was taken twice in a semester. Such feedback was conducted consecutive two years for institute A and 3 years for institute B. The data collected from feedback is at actual on the basis of number of feedback sessions conducted and the students present for the feedback sessions. The statistical record shows that, on an average, above 90% of the students on roll, were present for each feedback session. This feedback was further used to calculate the performance index of the teacher individually.

Table 5. 10 Number of Students admitted in the institute

Institute	AY	Semester	Class/Div	Students on roll.
A	2013-14	I	FE	104
A	2013-14	I	SE	125
A	2013-14	II	FE	103
A	2013-14	II	SE	125
A	2014-15	I	FE	62
A	2014-15	I	SE	264
A	2014-15	II	FE	62
B	2012-13	I	FE	205
B	2012-13	II	FE	203
B	2013-14	I	FE	134
B	2013-14	I	SE	120
B	2013-14	II	FE	133
B	2013-14	II	SE	120
B	2014-15	I	FE	134
B	2014-15	I	SE	95
Total				1989

5.1.7 Performance Index of individual teacher for a particular class / division

Based on the academic feedback received from the students in every semester for all theory subjects, Performance Index is to be determined for every question separately and average of all ten questions will be the overall Performance Index of the faculty for that particular class and subject.

Question-wise index is to be determined as follows.

T = Total students on roll = $x+y+z+r$ where, let us say that for Q.1, 'X' no. of students have said (ticked) 'yes/good' (5 marks), 'Y' no. of students have ticked 'No/Average' (3 marks) and 'Z' no. of students have ticked 'Don't know/poor' (1 mark), then, the faculty index for Q.1 (I_1) will be :

$$PI = \frac{\sum 5x + 3y + 1z + 0r}{5(Strength\ of\ Class\ or\ Students\ on\ roll)} X\ 100$$

Where ,

'x' is the no. of students who have said (ticked) 'yes/good' (5 marks),

'y' is the no. of students who have ticked 'No/Average' (3 marks),

'z' is the no. of students who have ticked 'Don't know/poor' (1 mark),

'r' is the no. of students who were absent at the time of feedback (0 Mark)

Example :

Strength of Class = T = 72;

Students present for first feedback = 62 and absent = r = 10;

Students present for second feedback = 65 and absent = 7.

$$PI = \frac{\sum(5 * 33) + (3 * 20) + (1 * 9) + (0 * 10)}{5(72)} X\ 100$$

$$PI = \frac{165 + 60 + 09 + 00}{360} X\ 100$$

$$PI = 65.00$$

With the same procedure the PI for second feedback is also calculated.

Table 5.11 Performance Index of a Teacher - A Sample

Question No.	PI (First Feedback)	PI (Second Feedback)
1	65.00	68.61
2	68.33	74.17
3	71.66	74.83
4	55.00	68.05
5	53.88	62.5
6	64.44	71.94
7	81.66	80.83
8	77.77	81.38
9	52.77	63.05
10	69.44	75.83
Aggregate PI	66.00	72.55

5.1.8 Performance Index (PI) of all faculties

In order to emphasis the research finding, the researcher has included all 35 teachers who were teaching simultaneously to first year and second year engineering students in the same year of same Institute.

The sample data presented below is PI of teachers who were involved in teaching the subjects at FY and SY students in a single institute.

Table 5.12 Sample Table of Performance Index of Teachers

S.N.	Teacher	Class	Sem.	Subject Taught	P.I.		Class Strength
					P.I.-I	P.I.-II	
1	T 1	F.E. A-1	I	Maths-I	85.60	86.30	21
		S.E.-Comp.	II	Maths-III	89.71	88.20	43
		S.E.-E & TC	II	Maths-III	92.44	85.56	27
		S.E.-Mech-B	I	Maths-III	84.90	86.60	67
2	T 2	F.E. A-2	I	Maths-I	78.77	87.00	25
		F.E. B-3	I	Maths-I	67.70	70.36	15
3	T-3	F.E. A-3	I	Maths-I	58.30	62.40	24
		F.E.-B	II	Maths-II	77.03	37.68	63
		S.E.-Civil-	I	Maths-III	83.2	79.13	52
4	T 4	F.E-B 1	I	Maths-I	63.8	68.00	24
		F.E-B 2	I	Maths-I	64.8	64.30	25

		F.E-A	II	Maths-II	76.68	75.29	70
		S.E-Mech-A	I	Maths-III	65.4	70.10	75
5	T 5	F.E-A	I	Physics	60.2	85.60	70
6	T 6	F.E-B	II	Physics	32.8	37.39	63
7	T 7		I	Basic Elex.	81.8	81.60	70
		F.E-B	II	Basic Elex.	65.83	40.98	63
		S.E.-E & TC	I	Signal System	72.65	65.00	27
		S.E.-E & TC	II	Control Sys.	81.74	77.04	27
8	T 8	F.E.-A	I	Basic civil	64.8	77.80	70
		F.E-B	II	Engg.Mechanics	37.98	53.73	63
		S.E.-Civil	II	S.A.-I	72.56	70.29	51
		S.E.-Civil	I	SOM	72.6	91.60	52
9	T 9	F.E-A	I	Engg.Graphics-I	56.61	71.20	70
		F.E-B	I	Engg.Graphics-I	64.8	56.61	64
10	T 10	F.E-B	I	Basic Elect. Engg.	78	69.00	64
		F.E-A	II	Basic Elect. Engg.	81.39	83.61	70
		S.E.-Mech-A	II	E.E.E.	70.57	89.42	72
		S.E.-Mech-B	II	E.E.E.	88.59	90.81	70
11	T 11	F.E-B	I	Chemistry	39.2	38.80	64
12	T 12	F.E-A	II	Chemistry	60.53	70.50	70
13	T 13	F.E-B	I	Basic civil	55	58.00	64
		S.E.-Civil	I	Surveying	68.5	71.60	52
14	T 14	F.E.-A	II	Engg.Mechanics	71	78.00	70
15	T 15	F.E.-A	II	Basic Mech. Engg.	63.2	66.93	70
16	T 16	F.E.-B	II	Basic Mech. Engg.	74.08	43.50	63
		S.E.-Mech.-A	I	F.M.	64.3	62.20	75
17	T 17	S.E.-Civil	I	B.T.M.	73.38	90.70	52
		S.E.-Civil	II	Conc.Tech.	70	71.08	51
18	T 18	S.E.-Civil	I	GTE	72.1	70.96	52
19	T 19	S.E.-Civil	II	F.M.-I	82.73	74.15	51
20	T 20	S.E.-Civil	II	A.P.D.P.	68	66.00	51
21	T 21	S.E.-Civil	II	Geoloogy	83.85	72.37	51
22	T 22	S.E.-Comp.	I	Discri. Struct.	84.02	74.30	44

23	T 23	S.E.-Comp.	I	D.S.P.S.	63.62	60.10	44
		S.E.-Comp.	II	Comp.Graphics	60	56.00	43
24	T 24	S.E.-Comp.	I	D.E.L.D.	68.8	93.00	44
		S.E.-Comp.	II	M.P.I.T.	84.63	84.80	43
		S.E. E& Tc	I	Digital Elex.	64.07	84.55	27
25	T 25	S.E.-Comp.	I	O.S.A.	75.17	75.00	44
		S.E.-Comp.	II	O.O.M.P.	78.77	59.82	43
26	T 26	S.E.-Comp.	I	M.P.A.	41.43	70.00	44
		S.E.-Mech.-A	II	E.E.E.	55.9	77.13	72
		S.E.-Mech.-B	II	E.E.E.	67.37	78.20	70
27	T 27	S.E.-Comp.	I	Comp.Org.	86.59	81.27	43
		S.E. E& Tc	I	D.S.A.	53.27	70.29	27
28	T 28	S.E. E& Tc	I	E.D.C.	55.93	76.35	27
		S.E. E& Tc	I	NetWork Theory	52.83	56.36	27
		S.E. E& Tc	II	Analog Comm.	76.11	83.78	27
29	T 29	S.E. E& Tc	II	I.C.	73.38	75.74	27
30	T 30	S.E. E& Tc	II	Comp.Org.	77.23	77.41	27
31	T 31	S.E.-Mech-A	I	M.P.-I	43.2	58.90	75
		S.E.-Mech-B	I	M.P.-I	62.2	64.80	67
		S.E.-Mech-A	II	Metallurgy	39.79	65.97	72
		S.E.-Mech-B	II	Metallurgy	60.82	70.97	70
		S.E.-Mech-A	I	Material Science	49.73	25.50	75
		S.E.-Mech-B	I	Material Science	65.88	50.26	67
32	T 32	S.E.-Mech-A	I	Thermodynamics	75.1	78.80	67
		S.E.-Mech-A	II	SOM	46.6	67.87	72
		S.E.-Mech-B	II	SOM	68.12	72.83	70
33	T 33	S.E.-Mech-B	I	F.M.	63	62.20	67
34	T 34	S.E.-Mech-A	II	TOM-I	53.55	57.34	72
		S.E.-Mech-B	II	TOM-I	51.38	55.58	70
35	T 35	S.E.-Mech-A	II	Applied Thermo.	66	88.28	72
		S.E.-Mech-B	II		82.36	81.47	70

Further the Performance Index of individual teacher was mapped with the performance of the students in terms of theory attendance; class test/on line test and university result of individual subjects.

5.1.9 Academic Record of Individual Students

Academic record of all students on roll from institute A and B for a period of 2012-13 to 2014-15 was collected. For first year, students have to study 10 theory subjects per year while for second year 10 – 11 theory subject per year. Academic record of each student for each subject in terms of theory attendance in a class , marks obtained in class test / online test and university examination is collected for a period of six semester for both A and B institutes. The record was maintained in the following format. Sample data is given in Annexure C.

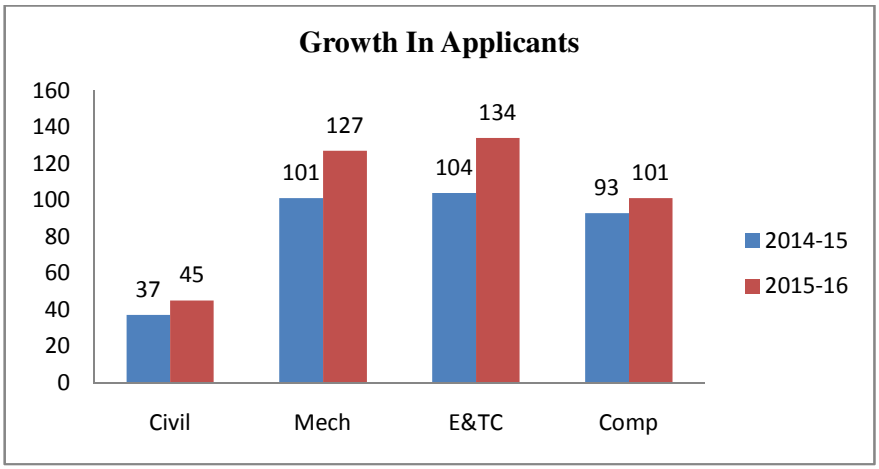
AY	Instt.	Class/Div.	Sem.	Name of student	Name of Subject	% attendance	% CT Marks	% Univ. Marks

5.2 Analysis and Interpretations

5.2.1 Teacher Recruitment Process

Table 5.13 Number of applications for teaching position

AY	Instt.	Branch			
		Civil	Mech	E&TC	Comp
2014-15	A	22	40	15	17
2014-15	B	7	27	39	22
2014-15	C	8	34	50	54
2015-16	A	20	31	16	15
2015-16	B	12	22	43	28
2015-16	C	13	74	75	58



Graph 5. 2 Growth in Applications for teaching position

It is observed that, number of applications is increasing slowly which indicates that the candidates are getting attracted towards teaching as a profession. There is a shortage of candidates from Civil branch as compared to other branches. It is because of secondary option at the time of admission process given by students and on the other hand, Civil Engineering branch was having fewer intakes across Maharashtra state in the last decade.

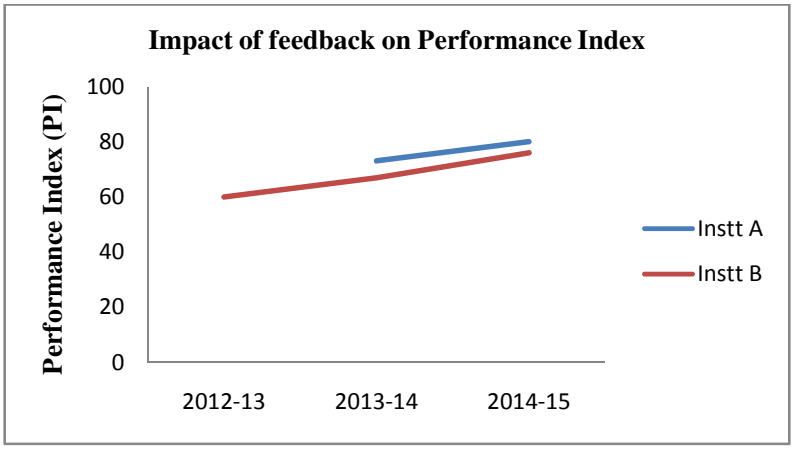
5.2.2 Induction Training for Teacher

In current scenario, it is the fact that no training on education (viz. B.Ed, M.Ed) is mandatory to adopt teaching profession in engineering institute. Although certified training of minimum six months on this issue will be beneficial to improve the basic quality of candidate as a teacher. Through interaction during induction training, importance of pedagogical training is well accepted by the participants. The participants have also realized the role of teacher after the induction training. The positive change in a perception about teacher was recorded during the training. Management of the institute also realized and appreciated the importance of such induction training.

5.2.3 Students Academic Feedback about individual teacher

The students are willing to give academic feedback of their teacher for better improvement. Teacher has also understood the importance of the student's feedback for their academic improvement through performance index. Graph 5.2 indicates that students feedback has a positive impact on teachers performance over the period of

three years. The average performance index (PI) of all teachers from both the institutes is 71 on the scale of 0-100. Students have observed the positive change in the teacher, based on the comments and weaknesses mentioned in their respective feedbacks. Over the period, it has been observed that, the comments and weaknesses mentioned by students are well taken in a positive spirit by the teachers. Table 5.7 indicates that immediate corrective action, by the teachers, can improve their PI immediately in the subsequent feedback. Due to this, the mechanism of feedback was well established in the respective institutes.



Graph 5. 3 Impact of Student's Feedback on Performance Index of a Teacher

Though the average Performance Index (PI) of all teachers is 71 on the scale of 0 to 100, it depends on the following factors:

1) Expertise in the subject domain of the teacher.
2) Innovative teaching practices adopted by the teacher.
3) Teacher may have a different PI at different levels (first year, second year,… etc. of Engineering) of teaching as well as for different subjects he/she is teaching.
4) Difficulty level of understanding a subject by the student.

5.2.4 Effect of Performance Index (PI) on Students Performance

The student's performance in a semester is recorded in the following aspects of teaching learning process:

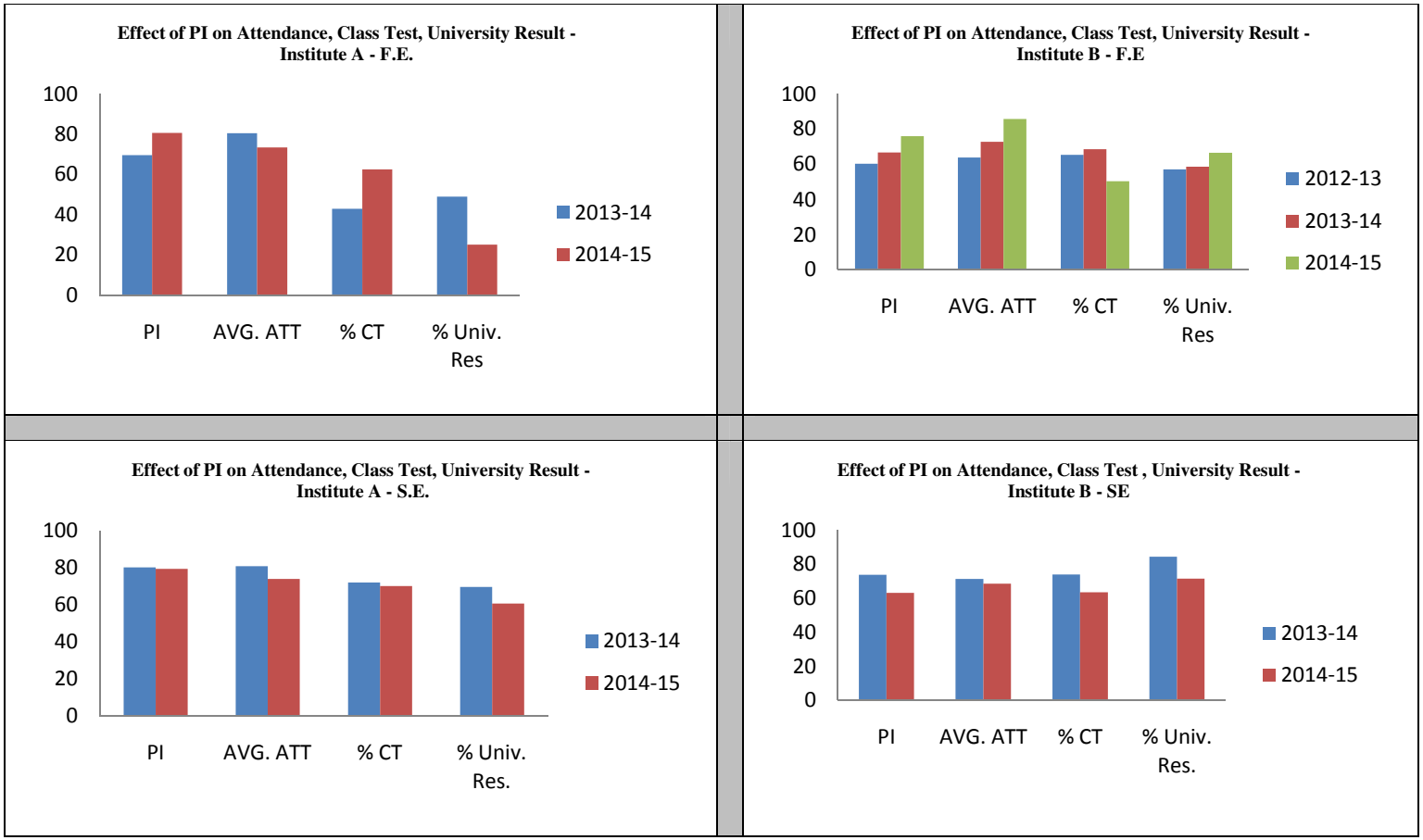
a) Attendance
b) Class Test / On Line Test
c) University Result

It is recorded that, students take interest and attend the maximum lectures conducted by the teacher, whose performance index is good.

The figure 5.3 depicts correlation between

a) Performance Index and Attendance for First Year Engineering and Second Year Engineering at Institute A and B for two and three academic years respectively.
b) Performance Index and Class Test for First Year Engineering and Second Year Engineering at Institute A and B for two and three academic years respectively.
c) Performance Index and University Results for First Year Engineering and Second Year Engineering at Institute A and B for two and three academic years respectively.

For institute B, it is observed that better PI , better is a student's performance for theory attendance, class test and university results. While same logic was not observed the institute A , the reason for this was due to frequent change of faculty in-between the semester, particularly for the two subjects, drastically hampered the university results.



Graph 5.4 Correlation between PI and Attendance, Class Test and University Results

5.2.5 Effect of Key Performance Indicators (KPIs)

In both the institutes, for consecutive three years TL process was implemented with policy based on the Key Performance Indicators (Lecture Schedule, Theory attendance, Lesson Plan, Question Bank, University Result analysis and student Feedback). The outcome of this has a positive effect on improvement in university result. For every subject minimum benchmark of result was result of immediate previous year. Expected increase in percentage result over an above this bench mark is treated as improvement in result.

In general, for every semester, student has to undergo five theory subjects. Out of these five subjects, it is possible to categorize them as easy, moderate and tough. While analyzing the subject wise university result of the institutes from both the universities, it is noted that easy category subject's average result is always above 85%, for moderate category subjects it is between 60% to 80% where as those subjects which are conceptual / technical base and categorized as tough, have result about 40% to 60%.

The identified institutes were monitored for performance of students at university results on the basis of categories of subjects identified and the respective passing percentage. The observation says that, in general there is an increase in the subject result in subsequent semester / academic year.

5.2.6 Effect of batch wise (small class) teaching

Batch wise teaching was implemented for the subjects who were perceived as tough subjects by the students and also has a history of poor university result. It was observed that batch wise teaching improves percentage hike in university result and is better method.

Chapter 6: Testing of Hypotheses

Statistical tools used for Hypotheses testing:

To test Hypotheses, Spearman rho correlation analysis is done. The variables of hypotheses 1, 2, and 3 are continuous variables. So Product Moment Correlation would have been an appropriate tool to compute the correlations between the variables. However, the study data did not satisfy the normality assumption and hence Spearman rho correlation analysis is done. Spearman rho correlation coefficient also known as Rank difference correlation method computes the correlation coefficient on basis of ranks assigned to the scores for the variables which are continuous or the data is on interval scale.

The data was entered in MS Excel, copied and analysed using SPSS Ver. 16.

H1: Students' attendance in a class facilitates their performance in university examinations.

To test this, 100% at actual data of two institutes was considered. The class attendance of all first year students and second year engineering students was taken. The marks obtained by all these students in University examination were recorded. The correlation coefficient between their attendance (that is number of lectures attended in one semester) and the marks obtained in the university examination (of that semester) was found using Spearman rho correlation.

For Institute A, there is positive correlation between attendance and university results of first year students. The Correlation Coefficient is 0.447 significant at 0.01 level. Also there is a positive correlation between attendance and university results of second year students. The Correlation Coefficient is 0.335 significant at 0.01 level.
Similarly, For Institute B, there is a positive correlation between attendance and university results of first year students. The Correlation Coefficient is 0.299 significant at 0.01 level. Also there is a positive correlation between attendance and university results of second year students. The Correlation Coefficient is 0.071 significant at .01 level

Institute	Year	Correlation Coefficient	Significant Level
Institute A	First	0.447	0.01
Institute A	Second	0.335	0.01
Institute B	First	0.299	0.01
Institute B	Second	0.071	0.01

Hence the hypothesis H1 'Students' attendance facilitates their performance in university examinations' is accepted.

H2 : Continuous assessment in terms of class test improves student's performance in their university examination.

To test this, 100% at actual data of two institutes was considered.

For Institute A, There is a positive correlation between class tests results and university results of first year students. The Correlation Coefficient is 0.503 significant at 0.01 level. Also, There is a positive correlation between class tests results and university results of second year students. The Correlation coefficient is 0.527 significant at 0.01 level.

Similarly at Institute B, There is a positive correlation between class tests results and university results of first year students. The Correlation coefficient is 0.569 significant at 0.01 level. Also , There is a positive correlation between class tests results and university results of second year students. The Correlation coefficient is 0.554 significant at 0.01 level.

Institute	Year	Correlation Coefficient	Significant Level
Institute A	First	0.503	0.01
Institute A	Second	0.527	0.01
Institute B	First	0.569	0.01
Institute B	Second	0.554	0.01

Hence the hypothesis H2, 'Continuous assessment in terms of class test improves student's performance in their university examination' is accepted.

H3: Performance Index of teachers has a positive correlation with student's performance in the university examination.

To test this, the data of 100% teachers from two institutes is considered.

For Institute A, There is a positive correlation between teachers' performance index and university results of first year students. The Correlation Coefficient is 0.091significant at 0.01 level. And there is a positive correlation between teachers' performance index and university results of second year students. The Correlation coefficient is 0.059 significant at 0.05 level.

Similarly for Institute B, There is a positive correlation between teachers' performance index and university results of first year students. The Correlation coefficient is 0.050 significant at 0.01 level and there is a positive correlation between teachers' performance index and university results of second year students. The Correlation Coefficient is 0.058 significant at 0.01 level.

Institute	Year	Correlation Coefficient	Significant Level
Institute A	First	0.091	0.01
Institute A	Second	0.059	0.05
Institute B	First	0.050	0.01
Institute B	Second	0.058	0.01

Hence hypothesis H3 'Performance Index of teachers has a positive correlation with student's performance in the university examination' is accepted.

Chapter 7: Observations and Findings

7.1 Observations

Based on research work and data collected, following are the observations.

7.1.1 Recruitment Process:

- Aspirant candidates who are in need of a job are unaware that teaching is also an opportunity for career enhancement.
- For strengthening fundamental knowledge / concepts, the candidate must practice the examinations like GATE (Graduate Aptitude Test in Engineering) examinations.
- It is observed that the more opportunities in teaching are available in the institutes located at rural places but the institutes in rural area are struggling to recruit qualified and suitable faculty.
- Experienced and senior faculties are reluctant to join newly established institutes located at rural place.

7.1.2 Induction Training

- Majority of the candidates are inexperienced and need pedagogy / teaching skills training.
- Induction program results in motivating teachers to work in a group and also to understand role of a teacher.
- For teacher, fundamental and technical skills are important at the same time soft skills and positive attitude is going to play a vital role in future.
- Innovative teaching attracts more number of students to attend the classes.
- Subjects can be categorized as (a) Difficult (b) Moderate (c) Easy to decide innovative methods in teaching learning process.

7.1.3 Teacher's Appraisal

- Performance of teacher is a guiding tool for the teacher to improve his / her academic performance.
- Teacher may have different PI at different levels (first year, second year,… etc. of Engineering) of teaching as well as for different subjects he/she might be teaching.
- PI is an indicator irrespective of difficulty level of understanding a subject by the student.
- Any teacher understands the exact improvement expected by the students,
- Immediate corrective action by the teachers can improve their PI immediately in the subsequent feedback.

7.1.4 Students

- Students do not prefer newly started engineering institute as their first choice, especially those located in rural area, at the time of admission.
- Students prefer to attend lectures of faculties who's Performance Index is better.
- Performance of students in the university examination depends on nature of the subject and its difficulty level.

7.2 Findings and Contribution of Researcher

- Key Performance Indicators (KPIs) were identified for effective teaching learning process.
- Projected shortage of faculty in Maharashtra for Engineering institutes
- Effective method of induction training along with its contents was developed to boost the morale of newly joined teachers.
- Effect of induction training positively resulted into performance of a teacher.
- Measurable parameters of a teacher were identified and measured.
- Method of calculation of Performance Index (PI) of a teacher is identified and implemented.

  Performance Index of a teacher is calculated based on student's feedback regarding teaching learning process as follows:

$$PI = \frac{\sum 5x + 3y + 1z + 0r}{5(Strength\ of\ Class\ or\ Students\ on\ roll)} X\ 100$$

Where 'x'is the no. of students who have said (ticked) 'yes/good' (5 marks), 'y' is the no. of students who have ticked 'No/Average' (3 marks) and 'z' is the no. of students who have ticked 'Don't know/poor' (1 mark) 'r' is the no. of students absent.

- Action plan for the management offering engineering education in rural area is developed to ensure effective teaching learning process in a institute which will lead to reduce the vacancy position at the time of admission.

7.3 Exclusive Findings about teacher's recruitment

For newly established undergraduate engineering institutes, located at rural places, qualified teachers are not available for recruitment.

The finding is based on the data acquired from three engineering institutes regarding educational qualifications of the applicant teachers have been analyzed by using chi square test. The data is tested on basis of branch wise comparison and institute wise comparison of the educational qualifications the aspirant teachers hold.

Table 7.1 Branch wise Comparison of Qualifications of Applicants for teaching position

Institute	Branch		Qualification			
			BE	ME (Pursuing)	ME	Total
Instt. A	CIVIL ENGG.	Count	42	24	16	82
		% of Total	5.7%	3.2%	2.2%	11.1%
Instt. B	COMPUTER ENGG.	Count	70	85	39	194
Instt. C		% of Total	9.4%	11.5%	5.3%	26.1%
	E&TC ENGG.	Count	83	90	65	238
		% of Total	11.2%	12.1%	8.8%	32.1%
	MECHANICAL ENGG.	Count	99	72	57	228
		% of Total	13.3%	9.7%	7.7%	30.7%
Total		Count	294	271	177	742
		% of Total	**39.6%**	**36.5%**	**23.9%**	100.0%

Chi Square: 14.33 (df 6, Difference significant at .05 level)

Interpretation: There are more teachers with BE qualifications or pursuing their ME and a fewer teachers with ME qualifications in all the branches of engineering course.

Table 7.2 Institute wise comparison on qualifications of applicants

Institute		Qualification			
		BE	ME (Pursuing)	ME	Total
INSTT. A	Count	79	35	62	176
	% of Total	10.6%	4.7%	8.4%	23.7%
INSTT. B	Count	81	71	48	200
	% of Total	10.9%	9.6%	6.5%	27.0%
INSTT. C	Count	134	165	67	366
	% of Total	18.1%	**22.2%**	9.0%	49.3%
Total	Count	294	271	177	742
	% of Total	39.6%	36.5%	23.9%	100.0%

Chi Square: 37.111(df 4, Difference significant at .001 level)

Interpretation: At institute C, more applicants are pursuing ME qualification than Institute A and B.

From the above two tables it is observed that qualified teachers recruited in engineering colleges are less.

- For newly established undergraduate engineering institutes, located at rural places, Performance of candidates applying for teaching position is poor in written test.

For this, Institute A, B, C were taken into consideration with 100% aspirant applicants. A written test was conducted for the recruited teachers and the scores were noted. The scores were continuous but were put into the range namely Upto 30, 31 to 40, 41 – 50, 51 – 60 and above 61. The continuous scores were thus categorized for two reasons. The data was analyzed using chi square test.

The data is tested on basis of branch wise comparison and institute wise comparison of the test results obtained from the written test, they had appeared for.

Table 7.3 Branch wise comparison on written test conducted

	Branch		Marks Obtained					
			Upto 30	31-40	41-50	51-60	> 61	Total
Instt. A	CIVIL ENGG.	Count	4	18	29	23	8	82
		% of Total	.5%	2.4%	3.9%	3.1%	1.1%	11.1%
Instt. B.	COMPUTER ENGG.	Count	71	74	42	5	2	194
Instt. C		% of Total	9.6%	10.0%	5.7%	.7%	.3%	26.1%
	E&TC ENGG.	Count	49	87	70	28	4	238
		% of Total	6.6%	11.7%	9.4%	3.8%	.5%	32.1%
	MECHANICAL ENGG.	Count	21	41	83	57	26	228
		% of Total	2.8%	5.5%	11.2%	7.7%	3.5%	30.7%
	Total	Count	145	220	145	113	40	742
		% of Total	19.5%	**29.6%**	19.5%	15.2%	**5.4%**	100.0%

Chi Square: 166.96 (df 12, Difference significant at .001 level)

Interpretation: Few applicants have scored above 60% in the test conducted. Most of the applicants fall in the range of 31 to 40%.

Table 7. 4 Institute wise comparison on written test conducted

Institute			Marks Obtained				
		< 30	31-40	41-50	51-60	> 61	Total
INSTT. A	Count	23	43	57	33	20	176
	% of Total	3.1%	5.8%	7.7%	4.4%	2.7%	23.7%
INSTT. B	Count	43	54	65	33	5	200
	% of Total	5.8%	7.3%	8.8%	4.4%	.7%	27.0%
INSTT. C	Count	79	123	102	47	15	366
	% of Total	10.6%	16.6%	13.7%	6.3%	2.0%	49.3%
Total	Count	145	220	224	113	40	742
	% of Total	19.5%	29.6%	30.2%	15.2%	5.4%	100.0%

Chi Square: 29.155(df 8, Difference significant at .001 level)

Interpretation: Few applicants have scored above 60% in the test conducted and performance in the test is the poorest for Institute C as almost 10.6% applicants have scored below 30. Most of the applicants fall in the range of 31% to 40% and 41%to 50% in all the institutes**.**

- For newly established undergraduate engineering institutes, located at rural places, Majority of the candidates are inexperienced in teaching.

To test this, the years of teaching experience was obtained from three engineering institutes. The years of experience was categorized as 0 to 1 year, 1yr.1month to 3 years, and 3years.1month to 5 years of experience. The researcher has done branch wise comparison and institute wise comparison for the years of experience of the teachers.

Table 7. 5 Branch wise comparison on teaching experience

Institute	Branch		Experience in Yrs			Total
			0 to1	1 to 3	3 to 5	
Instt. A	CIVIL	Count	50	22	10	82
		% of Total	6.7%	3.0%	1.3%	11.1%
Instt. B	COMPUTER	Count	132	42	20	194
Instt. C		% of Total	17.8%	5.7%	2.7%	26.1%
	E&TC	Count	129	53	56	238
		% of Total	17.4%	7.1%	7.5%	32.1%
	MECHANICAL	Count	118	61	49	228
		% of Total	15.9%	8.2%	6.6%	30.7%
	Total	Count	429	178	135	742
		% of Total	**57.8%**	24.0%	18.2%	100.0%

Chi Square: 20.712 (df 6, Difference significant at .01 level)

Interpretation: It is observed that 57.8% applicant teachers have 0 to 1 year of experience.

Table7. 6 Institute wise comparison on teaching experience

Institute		Experience in Yrs			Total
		0 to1	1 to 3	3 to 5	
INSTT. A	Count	89	57	30	176
	% of Total	12.0%	7.7%	4.0%	23.7%
INSTT. B	Count	113	60	27	200
	% of Total	15.2%	8.1%	3.6%	27.0%
INSTT. C	Count	227	61	78	366
	% of Total	**30.6%**	8.2%	10.5%	49.3%
Total	Count	429	178	135	742
	% of Total	57.8%	24.0%	18.2%	100.0%

Chi Square: 23.650(df 4, Difference significant at .001 level)

7.4 Summary of contribution by researcher:

The researcher has noted observation with respect to teacher recruitment process, induction training, appraisal of teacher and students.

The researcher has made his own contribution on projection of shortage of teacher in engineering institute in Maharashtra by 2018, identifying good qualities of teacher, identifying and measurement of parameters to appraise/evaluate academic performance of teacher, developed formula to calculate performance index of a teacher, developed a monitoring mechanism to ensure quality of Teaching-Learning process, and finally proposed/suggested modular action plan for the Managements of self financed private newly established undergraduate engineering institutes, located at rural places.

Chapter 8: Conclusion and Recommendations

8.1 Conclusion

The study has concluded with confident and concrete outcome for the managements of newly started engineering institutes (< 5 years age), especially in the rural area, that it is possible to offer quality technical education with the emphasis on teaching learning process even under the present constraints which will lead towards reducing the vacancy at the time of admission.

The research work concluded that,

1. Implementation of Key Performance Indicators (KPIs) leads towards effective teaching learning process.
2. Transparent recruitment process ensures identification of suitable and good quality teachers.
3. Induction training helps to motivate newly recruited teacher and affects positively on his/her academic performance.
4. Counselling, motivation, and corrective action by the management helps positively to improve Performance Index of a teacher
5. The academic growth of institute is completely dependent on the Performance Index of all teachers.
6. The student's performance of university examination in a academic year is dependent on his/her attendance in class, class test performance, and performance index of a teacher.

8.2 Limitations of Study

- Since, management of newly established institutes in rural places are afraid about the experimentation, and reluctant to share data therefore, the sample size for experimentation is restricted to three institutes.
- Since, the monitoring mechanism is related with university examination results, it is time consuming process and one has to wait till the university result are available.
- In newly established institutes, retention ration of faculty is very poor which results into delay for stabilizing teaching learning process.

8.3 Recommendations and Guidelines to the management

Based on the conclusions of the research work, the researcher has suggested the guidelines to achieve the quality in teaching learning process which will lead towards better academic results and 100% admissions. With due respect to the guidelines given by NBA , AICTE, DTE and the respective university regarding norms and standards to be followed, the guidelines are for the engineering institutes established in rural area and having age less than five years.

The steps propose the following guidelines for the managements of self financed institutes, in general and those located in rural areas, in particular.

1. Association with reputed institute as a 'Role Model' institute:
2. Recruitment Process of faculty
3. Induction Training
4. Effective Teaching Learning Process and Academic Monitoring
5. Role of Management / Administration

1. Association with reputed institute as a 'Role Model' institute from management perspective.

Step I : Visit well performing institutes and institutes of higher learning in your area / state.

Step II : Identify any one institute which is willing to have frequent interaction with you.

Step III : Identify the institute which has an excellent academic performance and ready to spend time for development of new institute.

Step IV : Establish academic collaboration with such institutes, at least for five years, from the date of collaboration.

2. Recruitment Process of Faculty

Step I : Set up transparent faculty recruitment process to encourage recruitment of qualified and experienced faculty.

Step II: Identify and recruit senior faculty by reference.

Step III: Based on work load calculation, advertise the posts in reputed news papers at state level and regional level in English and regional language.

Step IV: The best period proposed for advertisement is: 15th Apr to 15th May. (This period is suitable to attract senior faculty, fresh M.Tech graduates and those who would like to switch over the jobs.)

Step V: Identify senior faculty from 'Role Model' institute to carry out interview process.

Step VI: Provide hospitality to the applicants at the time of recruitment (Transport, Tea, Snacks, care taking approach, etc)

Step VII: Conduct branch wise written examination based on 'GATE' examination pattern.

Step VIII: Conduct class room presentation for examining confidence, communication skill, attitude, pedagogy skills, and domain knowledge for the shortlisted candidates from written examination.

Step IX: Conduct HR interview of the shortlisted candidates from class room presentation, to understand willingness to work, family background, ambitions, future plans, salary expectations, etc.

Step X: Issue an offer letter on the same day, if not, at the most on the very next day.

Step XI : Identify the appropriate day and date between 15th May and 31st May as joining period for the newly recruited candidates.

Step XII: Assist the newly recruited faculty for stay, transport, working place, opening bank account, library and internet memberships, etc. so as to make them comfortable and happy.

3. Induction Training

It is mandatory for all the newly recruited faculties to undergo induction training. The objective of the training is to know more about the institute and its culture as well as for one to one dialog with the management.

Step I : Invite experts to conduct induction training of all the teachers and nominate management representative to participate in induction training.

Step II: Participation of the Head of the Institute (Principal) is mandatory.

Step III: The preferred period for training will be 1st June to 15th June.

Step IV: The training will have focus on role of a teacher, quality in technical education, teaching learning process and the necessary preparations for the same.

Step V: Expectations of and from the teachers.

4. Effective Teaching Learning Process and Academic Monitoring

Set up an academic calendar inclusive of monthly tests and monthly student's feedback to get effective results of steps mentioned below.

Step I : Understand important parameters for Teaching Learning Process :

A. Classroom teaching :
    1. How good is it?
    2. Punctuality, regularity, clarity on blackboard, communication skills – spoken, knowledge, qualification, interaction in the class.
    3. Lesson plan, time management.
    4. Understanding by the students, feedback by the teachers, assessment of students.
    5. Feedback of the teacher by the students, mentoring of students / teachers.

B. Hands on training :
    1. Conventional laboratory work, setting up proper experiments, lab manual.
    2. Innovative experimental set ups, assessment of students for skills of application.
    3. Mini, small, medium projects, full scale projects and its assessment.
    4. Industrial training / internship

C. Teaching outside curriculum (Value Added Input) :
    1. Gap analysis, courses to bridge the gap.
    2. Industrial visits
    3. Paper presentation, project competition.

Step II : Academic Monitoring

Implement the scheme to monitor the academic progress and review academic processes and teacher's performance on a monthly basis.

Following are the points for consideration as Key Performance Indicators (KPI) during the initial stage.

- Lecture schedule – The Head of the Institute (HOI) is expected to issue a time table to all the students and staff right from the commencement of the semester. HOI is expected to keep the track of number of lectures scheduled against actually

engaged on a daily basis per class and on weekly basis per subject, course, staff and class.

- Attendance – The HOI will organize to record the attendance of all the students attending lectures / practicals / term work. The record of the attendance for each subject and for every student is to be maintained on a daily, weekly and monthly basis.
- Lesson plans – All the faculty teaching various subjects / practicals / term work are supposed to prepare, submit and announce their lesson plan for the course work at the commencement of each semester. The HOI will organize to receive the success in terms of percentage of completion of the lesson plans for the individual subject and faculty on a weekly as well as monthly basis.
- Batch wise teaching: Categorize the subjects into Easy, Moderate and Difficult level. For difficult level subjects, prefer batch wise teaching.
- Class Test: Design a proper question bank for class test and circulate it to the students, well in advance. A class test be conducted, for each subject, after every two weeks in the first hour of the alternate day and the result be recorded. Weak students so identified should be provided with a remedial teaching on weekends.
- After completion of a semester and when the results of the previous university examinations are available then percentage result per course per faculty should be prepared.
- The performance evaluation of all faculties by the students will be considered as a mandatory requirement for all theory subjects. It should be carried out at the end of each month / four week period. Following are the points based on which this appraisal will be carried out, either in hard or soft form. The students will have to choose one of the options for each parameter monitored like Good (5) / Average (3) / Poor (1).
    a. Regularity.
    b. Punctuality.
    c. Presentation on blackboard.
    d. Interaction during the class.
    e. Effective communication for better understanding of the students.
    f. Satisfactory completion of lessons planned.

Step IV: Calculate performance Index (PI) of every teacher in every subject as follows:

$$PI = \frac{\sum 5x + 3y + 1z + 0r}{5(Strength\ of\ Class\ or\ Students\ on\ roll)} X\ 100$$

Where 'x' is the no. of students who have said (ticked) 'yes/good' (5 marks),

'y' is the no. of students who have ticked 'No/Average' (3 marks) and

'z' is the no. of students who have ticked 'Don't know/poor' (1 mark)

'r' is the no. of students absent (0 Mark)

Step V: Analysis of Academic Monitoring

Perform the comparative study to understand the progress

- No. of lectures held against planned.
- No. of units completed against planned.
- Total attendance of students in the class.
- Performance of the students in the class test.
- Relation of class tests performance to their attendance per subject.
- Relation of internal and university examination results to their attendance.
- Relation of PI of a teacher with university result of respective subject.

Step VI: Attendance

Develop administrative mechanism to ensure attendance of all students in classes, for better performance of the students.

5. Role of Management / Administration

Step I: Provide support and infrastructure required to carry out suggested steps.

Step II: Take a cognizance of comparative analysis of academic monitoring in time and schedule remedial training for teachers with low performance index with a crystal clear understanding that PI is not for removal of the faculty but is to improve performance of the faculty.

Step III: Motivate the senior faculties to provide value added inputs beyond classroom teaching from employability perspective.

Step IV: Identify the senior faculty as a Training and Placement Officer (TPO) for improving Industry Institute Interaction.

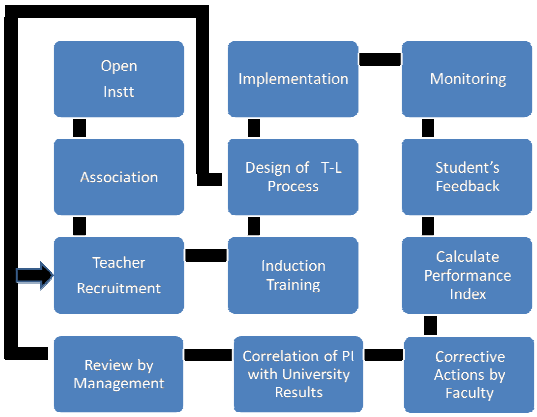
Step V: Calculate Success Rate (Sr) of a particular batch in term of placements on the basis of

$$Sr = \frac{No.\,of\ Students\ Placed}{\text{No. of Students Eligible for Placement Activity}}$$

Step VI : Organise mentoring for teachers to improve their performance index.

Step VII : Appreciate well appraised teachers in the annual public function.

The implementation of proposed model will ensure the improvement in teaching learning process in turn the quality of overall institute which will lead towards preparation for accreditation like NAAC, NBA as well as brand building.



8.4 Future Scope

The future scope for further research is to :

1. Identification of additional Key Performance Indicators of teaching learning process.

2. Identify additional and measurable parameters for calculating performance index of teacher and its methods of implementation.

3. Identify and to measure parameters of non-teaching / supporting staff in development of institute.

4. Identification of innovative training model to educate administrative management particularly newly established technical institutes to understand importance of various parameters that will ensure quality education in their institute.

5. To study, how to improve GER in engineering education and the reasons for declined trend of student towards engineering education especially in rural area.

Publications

The researcher has published following publications:

International Conference : First Author

- P.B. Kulkarni, H.K. Abhyankar, A.M. Kulkarni, S.S. Kulkarni, "Improving Effectiveness of Teaching for Enhancing Employability of Engineering Graduates", 5th International Conference on Industrial Engineering and Operations Management (IEOM) sponsored by IEEE, Lawrence Technological University, Dubai, UAE, March 2015.
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International Conference : Co-author

- A.M. Kulkarni, H.K. Abhyankar, P.B. Kulkarni, S.S. Kulkarni, "A Guideline for the Management of Institutes for Enhancing Career Opportunities of Fresh Graduates of MCA", 3rd Dubai International Conference in Higher Education, Michigan State University, Dubai, UAE, Feb 2015.
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- A.M. Kulkarni, H.K. Abhyankar, P.B. Kulkarni, S.S. Kulkarni "Career Development Challenges in Front of MCA Institutes in Pune Region… A Management Perspective" in National Conference on "Challenges to Contemporary Indian Higher Education" organized by Tilak Maharashtra Vidyapeeth, Pune November 2012

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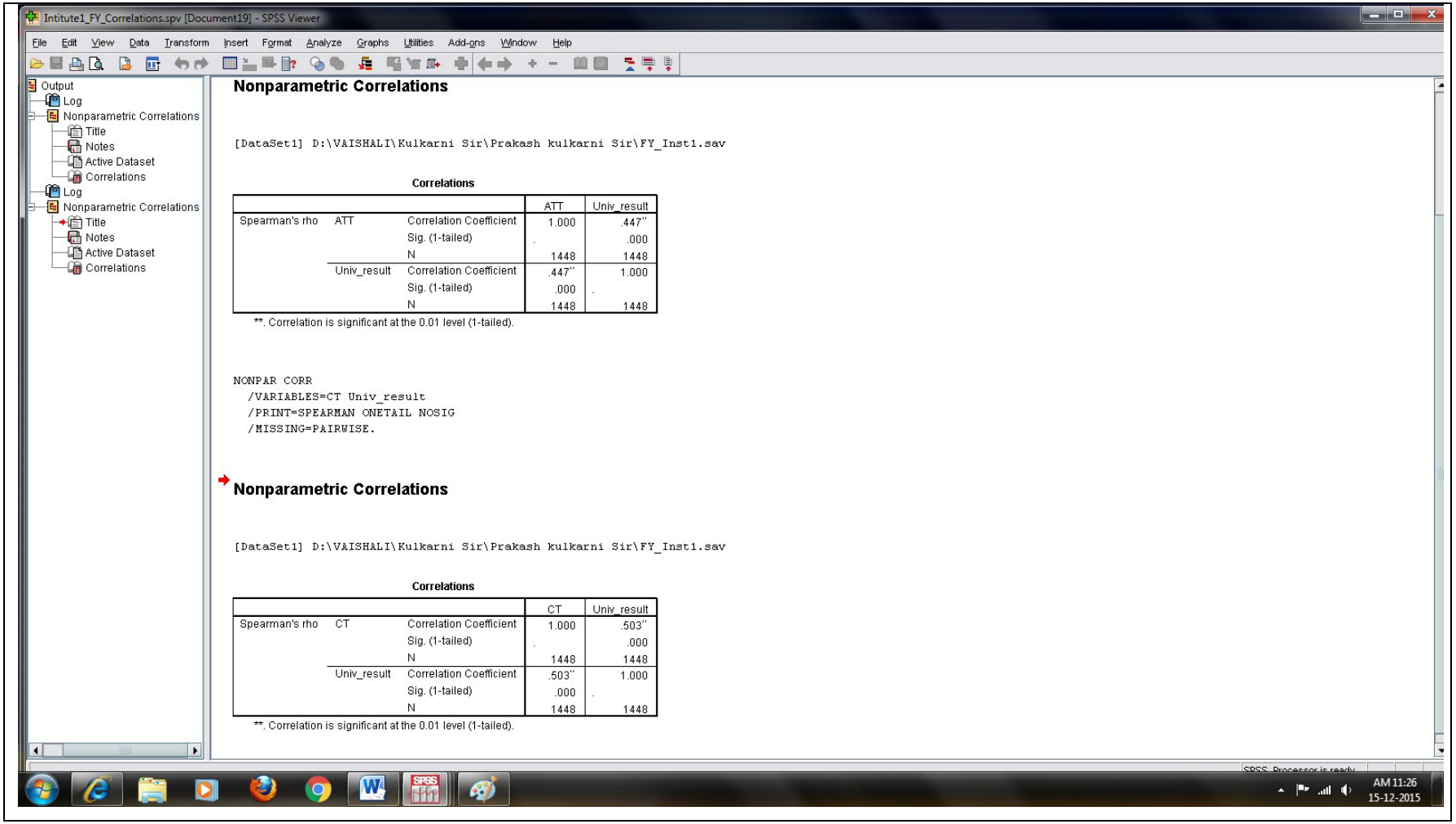
Annexure 1

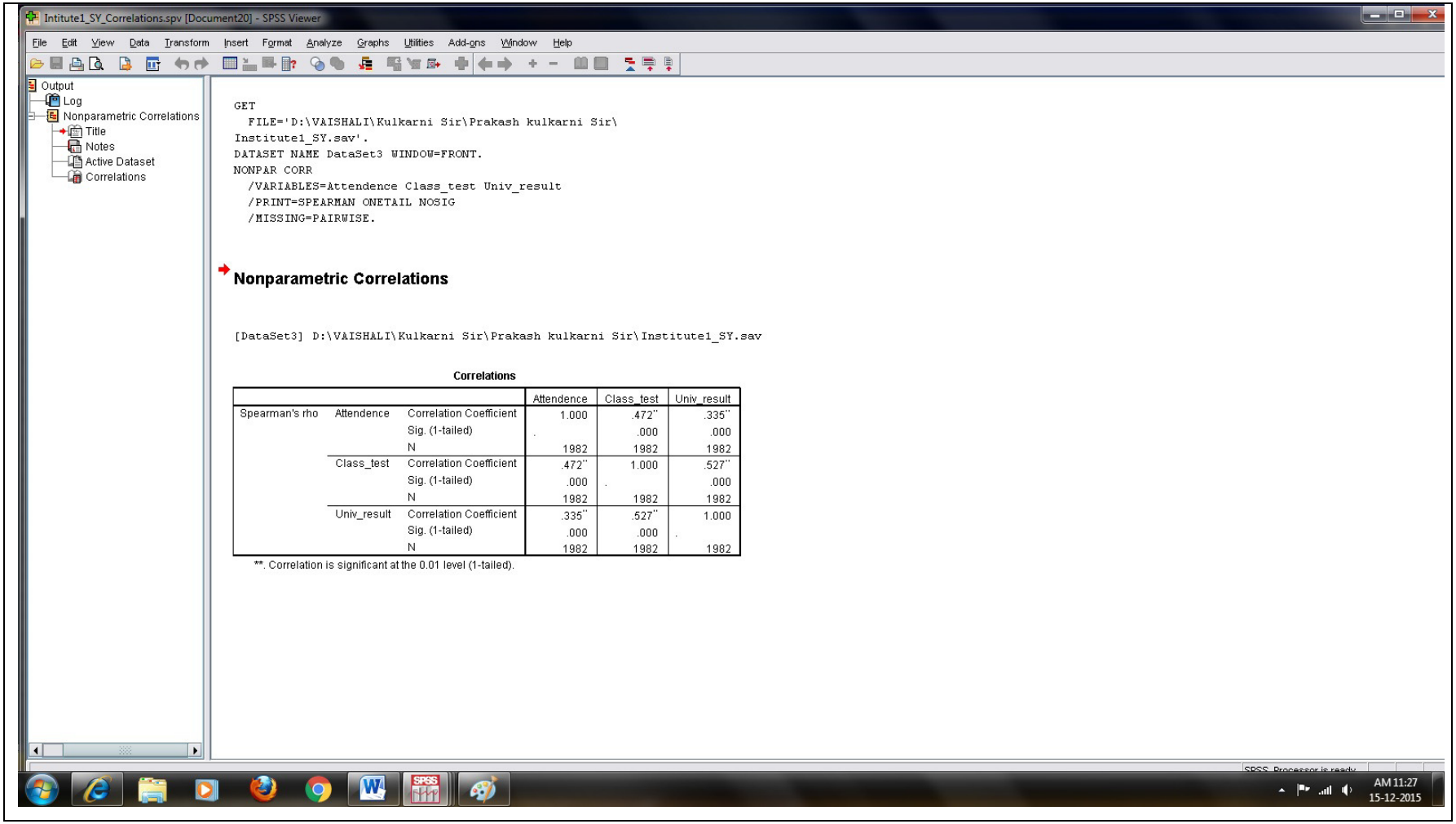
Sample Data : Student's Academic Record

A.Y.	INSTT	CLASS/DIV	SEM	SUBJECT	FACUTY	PI	STUDENT	ATT%	CT%	UNIV.%
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Adsule Rahul Rajendra	34	60	49
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Anarse Omkar Rajendra	66	62	47
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Arote Nehal Rohidas	69	52	50
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Awasare Rohan R	46	52	37
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Bacchav Vivek Bhila	51	62	33
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Bajgude Atul Bandu	51	38	19
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Barave Prasad Khandu	63	46	32
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Bhamare Rohit Suresh	49	30	15
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Bharam Rohit Tukaram	77	44	42
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Bhimale Kunal Sanjay	49	56	37
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Bhojkar Rushikesh B	77	40	27
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Bhor Harshal Goraksh	77	64	47
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Binny Paul	83	50	37
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Bomble Sadguru K	91	48	31
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Borade Sagar D	46	40	26
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Burse Rutvik Pramod	66	44	34
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Chaudhari Devendra A	49	38	23
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Chaudhari Vishal P	89	66	56
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Chaudhary Suchetan S	43	50	27
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Chopade Pavankumar P	37	28	25
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Choudhary Sagar Ashok	54	70	60
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Deokar Parag Hari	60	46	28
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Deore Rohan Sahebrao	51	34	20
2012-13	INSTT B	F.E. A	SEM I	MATHS 1	SG	70	Desai Akshay Sanjay	74	60	40

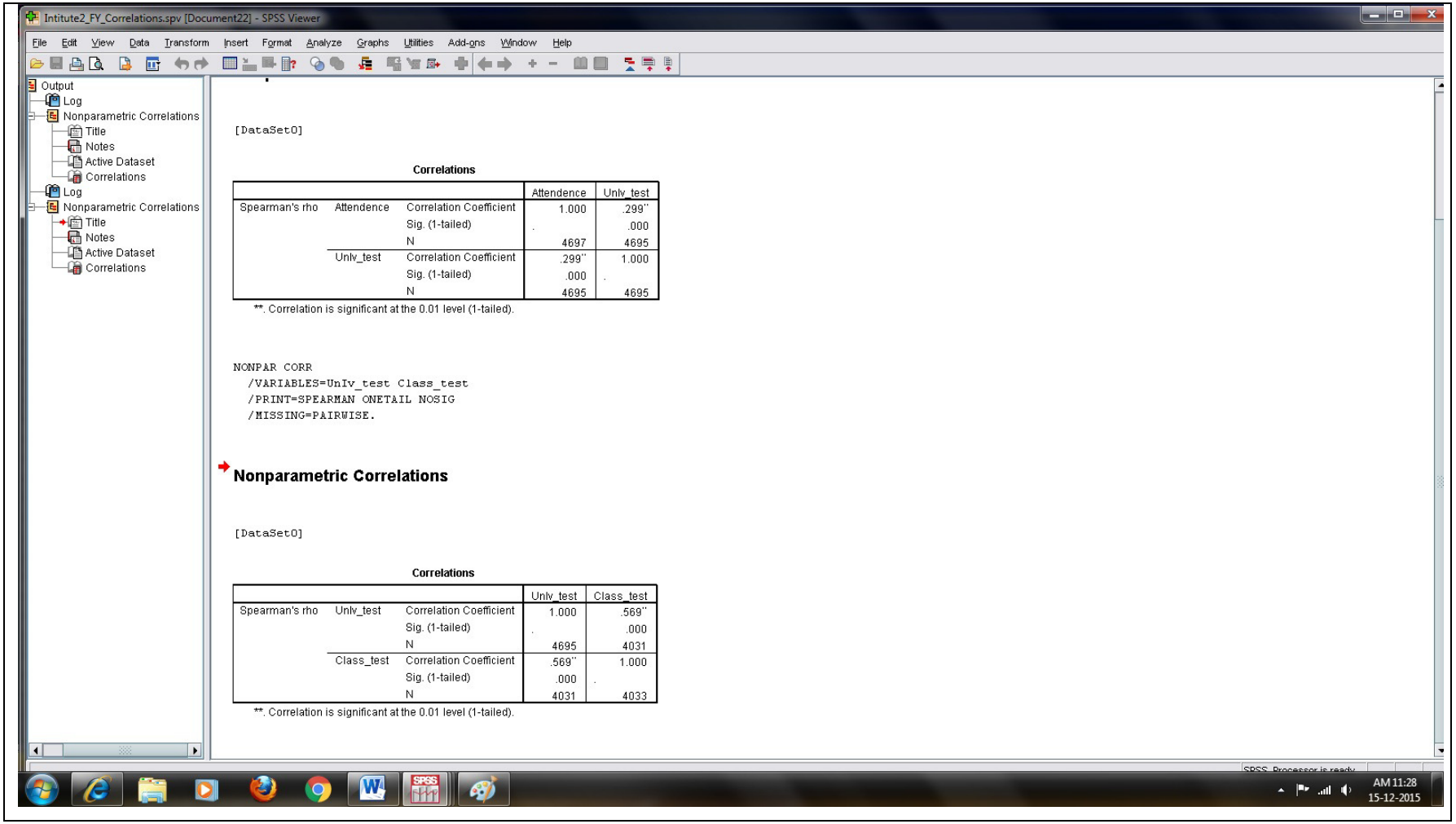
Annexure 2



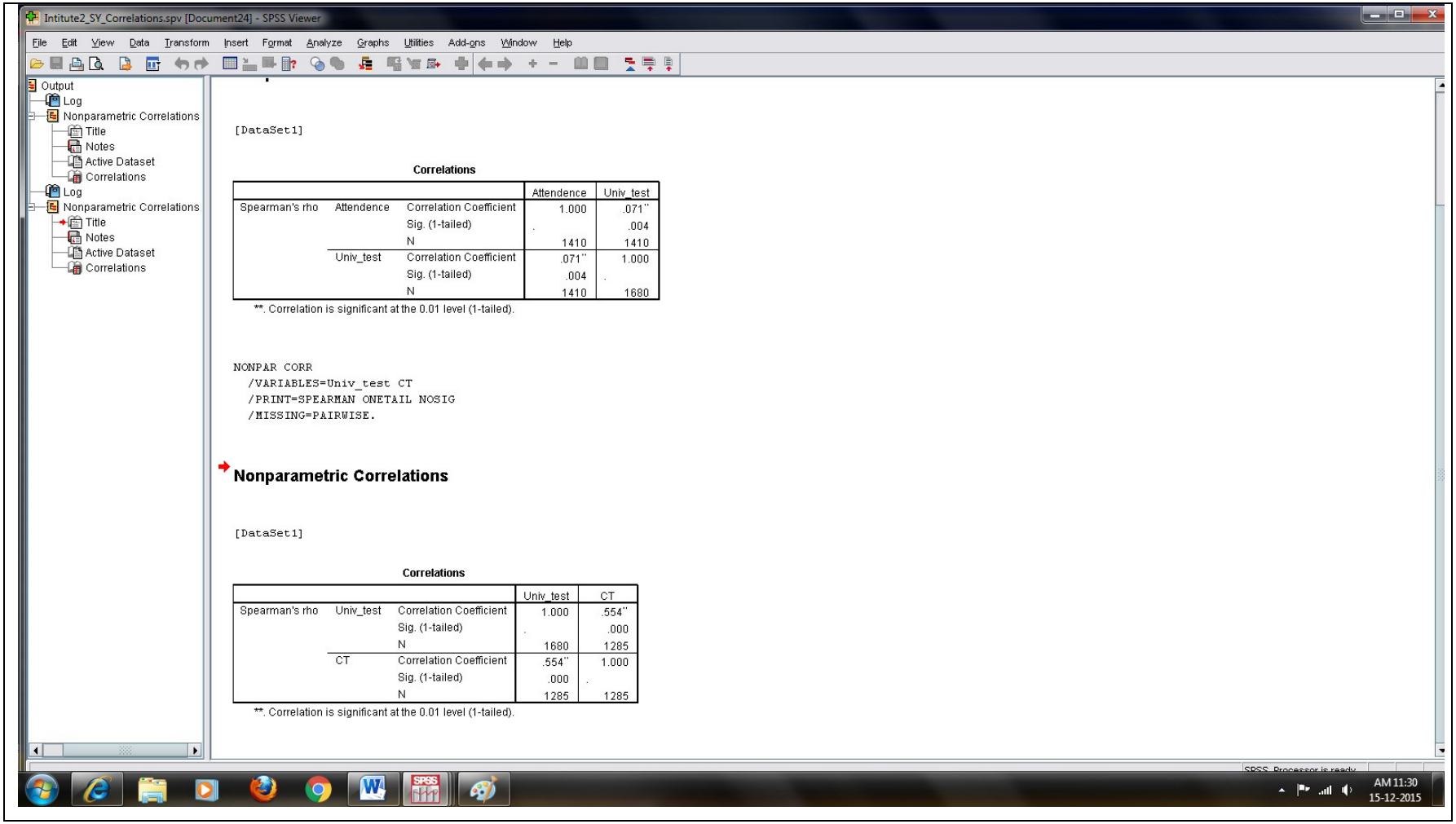
H1 + H2 : Institute A - First Year



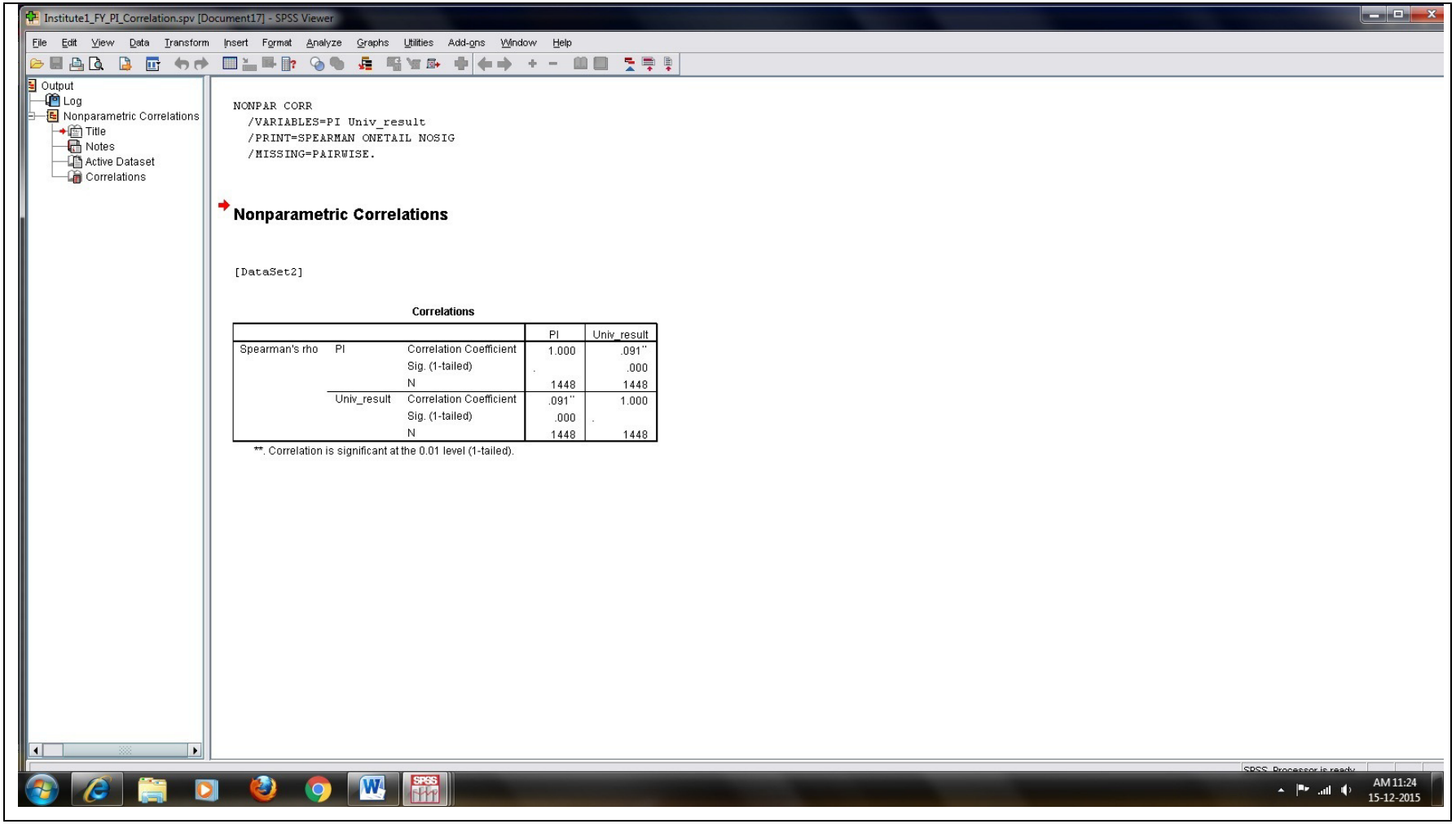
H1 + H2 : Institute A - Second Year



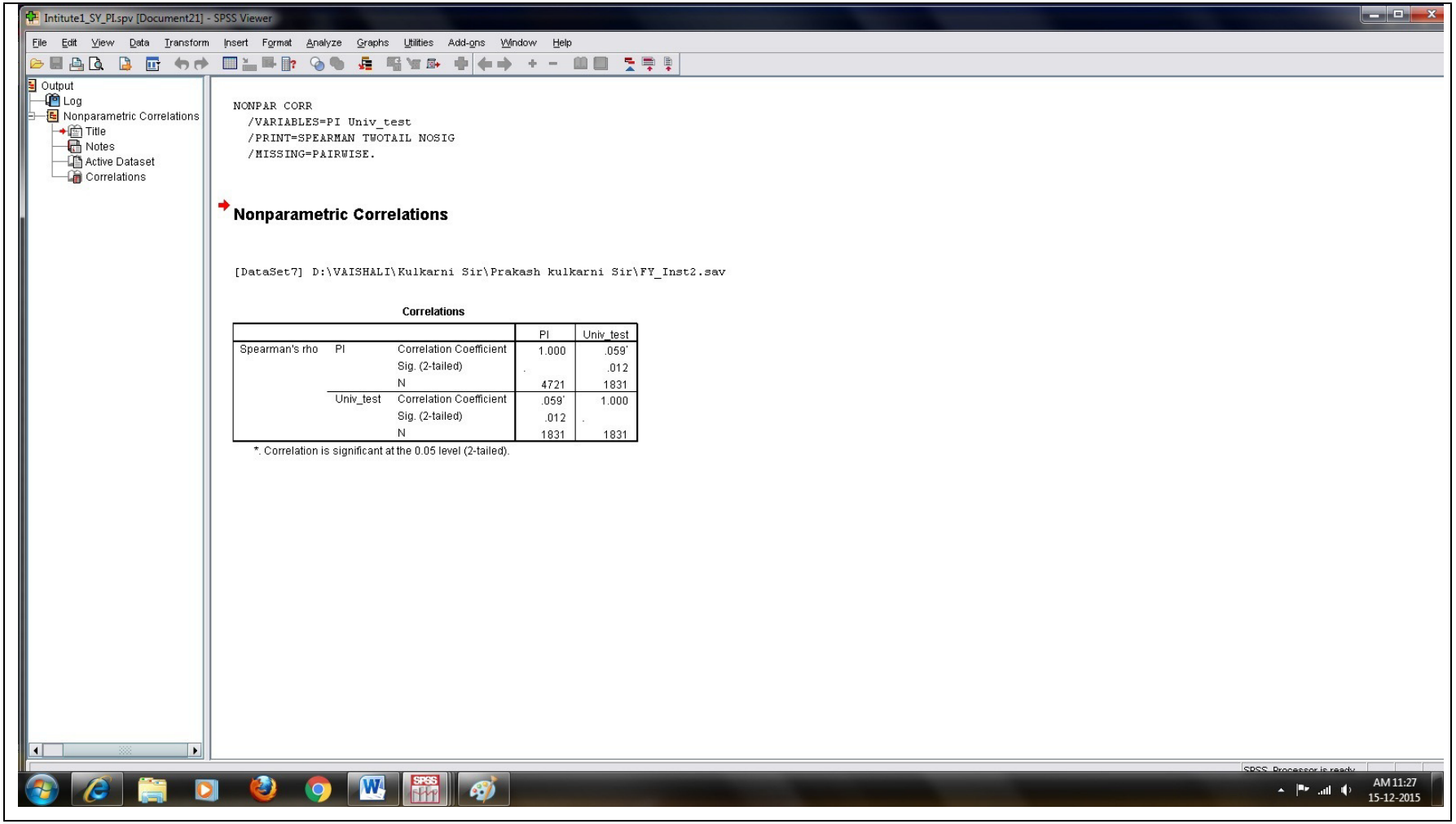
H1 + H2 : Institute B - First Year



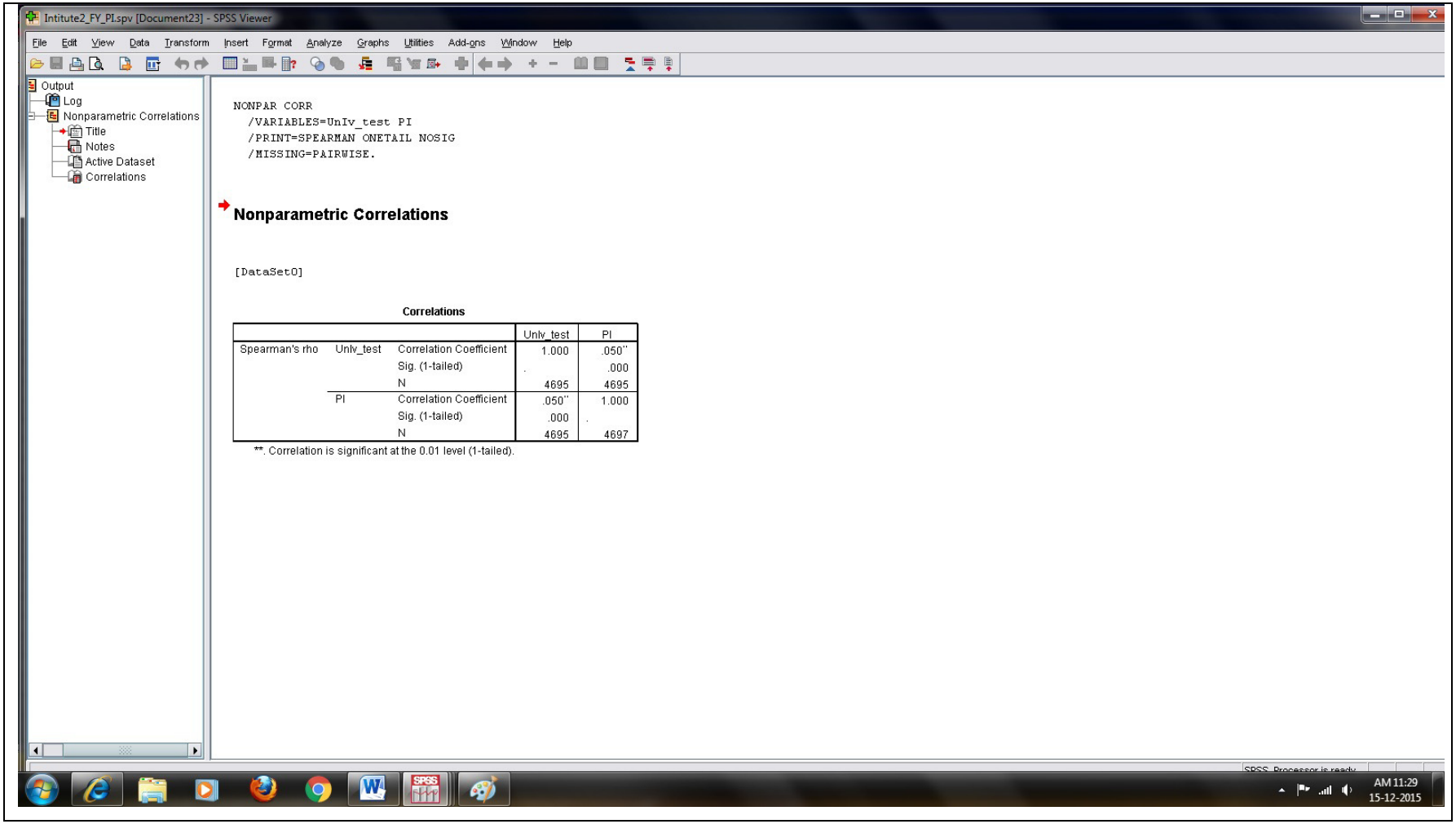
H1 + H2 : Institute B - Second Year



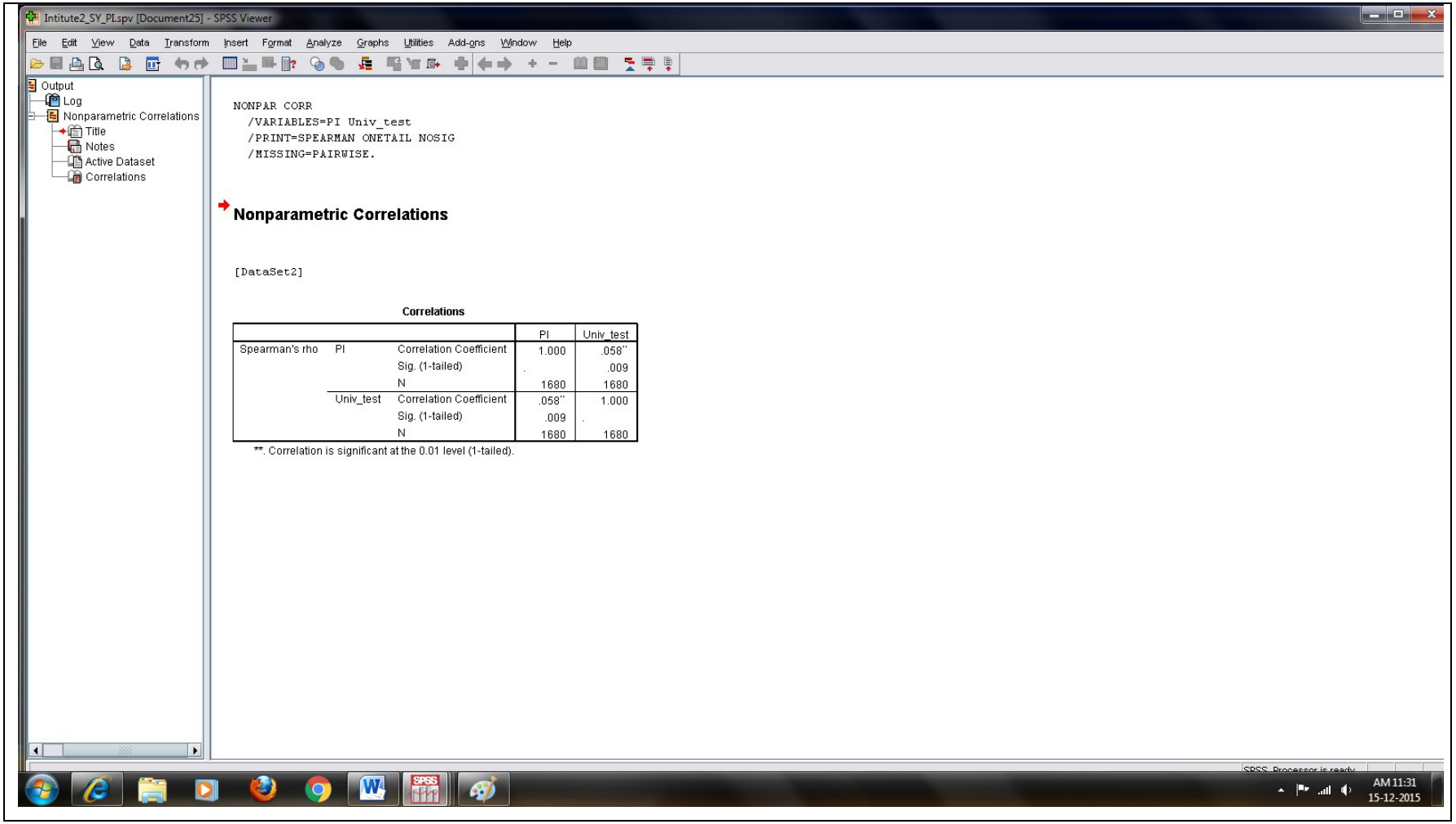
H3 : Institute A - First Year



H3 : Institute A - Second Year



H3 : Institute B - First Year



H3 : Institute A - Second Year

ANNEXURE 3

Improving Effectiveness of Teaching for Enhancing Employability of Engineering Graduates

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***Abstract*— India is a highly populated nation. The diversity in terms of geography, weather conditions and languages is phenomenal across the country, although, the culture remains the same. It is believed that a large majority of the people in the country belong to middle or low income group. Traditionally the school education in the country is considered to be powerful for training the students in mathematics. As majority of the students are job seekers and need to earn immediately after completing their education, many of them have started joining engineering programs, for their career. Private trusts have been permitted to set up educational institutions in India on no-profit basis and about 90% of the students undertake engineering education in private institutions. The institutes earn their cost through the tuition fees charged to the students, which are approved by the Govt. The students have a choice to join any institute in a State through a single window system. The students join such institutions which can offer jobs immediately on completion of their education. The industry has felt that many engineers have a formal degree but do not satisfy their requirements for employability. There is a need to look at the Teaching-Learning process which can impart adequate technical knowledge to the students to make them employable. The authors have conducted several workshops for teachers of engineering colleges and have identified parameters, in terms of qualities of teachers, which are measurable. A questionnaire has been designed to seek feedback from all the students at regular interval (monthly basis) to carry out such measurements leading to a performance index (PI) of a teacher. Teachers' can take efforts to improve their PI continuously. The managements of the institutes have also agreed to link PI to the financial annual increments. This paper presents results of such measurements at one particular institute.**

***Keywords*—** Teacher Quality Measurement; Performance Indicator; Students Feedback; Performance Improvement; Teaching Learning Process

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I. INTRODUCTION

India is a highly populated nation. The current census in 2011 gives the population of the country to be 121 Crores[1]. The country is like a peninsula which is surrounded by ocean on eastern, western and southern side. It has the highest mountain range of Himalayas on the northern side. As the country was ruled by the Britishers for about 150 years, English has been the language for instruction for all professional courses which has become a great advantage to the students. It was mainly the public institutions which were imparting technical education and hence the intake to engineering undergraduate program was limited to less than eight thousand, in 1951 when India had become a free republic nation. The states in the country adopted a policy to allow private trusts to set up engineering institutions offering UG programs and offer an opportunity to the students to seek jobs in creating wealth for the nation. Table 1 depicts exponential growth in the number of institutions and thereby the intake capacity for such education[2].

Table 1: Exponential Growth in Engineering Institutes

Year	Engg.	Intake	Faculty Required
2005-06	1475	499697	33313
2006-07	1511	550986	36732
2007-08	1668	653290	43553
2008-09	2388	841018	56068
2009-10	2942	1071896	71460

2010-11	3241	1324246	88283
2011-12	3393	1485894	99060
2012-13	3495	1761976	117465

Government of India established All India Council for Technical Education (AICTE) by an Act of the Parliament in 1987. This body regulates the intake capacity for every engineering program run by any institution and gives guidelines for norms and standards for establishing such institutions[2]**.**These norms and standards specify the infrastructure as well as faculty requirement to be met with by an institute. The standards stipulated for faculty requirement is in the ratio of 1:15 students. The Table1 shows that the number of qualified faculty required has also been exponentially increasing. The minimum qualification expected for the engineering teachers is a masters' degree for 2/3rd of the teachers and remaining number of teachers should have a doctorate degree in engineering[2].

A study has shown that qualified teachers, in such a large number, are not available in the country[3]. A large number of newly started institutions recruit fresh engineering undergraduates to undertake teaching profession. This has been leading to a complex situation where a large number of IT graduates are available every year from different universities, but NASSCOM claims that very few graduates are employable, in addition, ministry of Human Resource and Development, New Delhi released a report which supports this view expressed by NASSCOM[4].

II. ENGINEERING EDUCATION IN INDIA: CURRENT SCENARIO

The Government has established various universities which are run by them. India has a typical system of affiliating large number of institutions to a government funded university (the Govt. has, off late, permitted private Universities to open up which are not permitted to affiliate any other institutions). Almost all engineering colleges in a particular geographical area are affiliated to a particular University in each state. An university like Savitribai Phule Pune University or University of Mumbai, for example, may have more than 600 institutions affiliated to each of them, spread over several thousand sq. kilo meters. The Universities frame curriculum, the teachers in each college teach the curriculum which is set by the affiliating University. The students appear for the examinations conducted by the affiliating University. Such affiliating University enrolls the students for examination, set the examination papers, conduct theory as well as practical examinations, assess the answer books of students for theory examinations centrally, declare the results and award a degree at the end of the program.

The Need:

The number of public institutions is less and their costs are funded by the government. They have been established many years ago and can attract qualified teachers as they can afford to give adequate facilities to them. The private funded trusts have to run their institute on the fees prescribed by the government which are paid by the students who have joined their institution. The fees are prescribed by the government on the basis of sanctioned intake of the programs. The institution has to recruit faculty and create infrastructure on the basis of this sanction intake. If the number of students joining the institution is less than the sanctioned intake, then, the fees collected do not meet the cost of education. All the admissions to engineering institutions, for such privately funded institutions, are done through a single window system, by the State Govt. In this system, the students have a freedom to choose an institute / program, based on their inter-se merit at the qualifying examination. A study has shown that the students prefer such institutions which offer better placement and has qualified faculty[3]. The managements of various institutions are, therefore, very keen to see how their students become employable immediately after completion of their study. As the senior and qualified faculty is not available in adequate number, it becomes very difficult for the managements of privately funded institutions to attract good faculty in sufficient numbers. It is therefore necessary for the managements to recruit and train the faculty so that they can impart proper training to the students for enhancing their learning capabilities.

A study has shown that the important parameter for employability of the fresh graduates is sound technical knowledge[5]. Without adequate technical knowledge, a graduate cannot aspire for a better job. The present University affiliation system creates students who study the subjects only from the point of passing in the examination and may tend to lose the importance of acquiring knowledge to inculcate an ability to solve practical problems. Therefore it has become very important, for the managements of these institutions, to find out what qualities of teachers can ensure better results in the examinations and still ensure that the students acquire and retain adequate technical knowledge for their employability. With reference to learning objectives as per ABET for a particular engineering course, a software programme is developed for quantifying learning& teaching performance of a course & corrective actions to be taken for improving the course quality. In this paper, quality function development (QFD) is used to develop the process of measuring the level of learning performance of an engineering class. It also mentions the teaching performance factors are communication skill, student focus, knowledge/expertise, attitude about enhancing student learning, interaction with student & improvement in teaching performance[6]. Impact of teacher's competency on a job performance mentions competency can classify teacher as excellent ones & ordinary ones, based on the parameters viz. motivation, individual trait, knowledge, attitude, values, etc. The method adopted for measurement of job performance was based on feedback from superintendents, colleagues of Universities of different background[7]. University Grants Commission of India (UGC) have proposed academic performance indicators (APIs) for teaching faculty in colleges for recruitment & promotions. This APIs are based on assigning weightages to various category of work executed by the faculty in the area viz. teaching learning process, co-curricular & professional development related activity & research. The score are obtained by the faculty on self-appraisal& these scores are duly verified by screening committee[8]. Statistical information regarding availability of number of P.G. & Ph.D in the year 2009 in India indicates, India's higher technical education is good in small pockets, but far from world class. The bulk of it is of poor quality, producing graduates many of whom are unemployable. The Main reason for this is shortage of qualified teachers, shortage or absence of infrastructure and lack of academic autonomy in all aspects of the technical education system[9].

III. THE HYPOTHESIS

Traditionally the Indian culture has adopted a 'Gurukul' system for education. A 'Guru' is supposed to be a knowledgeable person who can impart adequate education to his / her students leading to a better life. The 'Guru' was supposed to define the curriculum which was apt for the then current requirements and was also supposed to assess the students. It was up to the students to acquire the knowledge and skills from their 'Guru'.

In the current Indian scenario, a large number of students are taught various subjects by a variety of teachers. Most of the students like or dislike a teacher based on his / her characteristics or qualities. Therefore the hypothesis:

1. It is possible to identify the measurable characteristics or qualities of a teacher.
2. It is possible to improve these qualities by taking proper feedback from the students.

IV. RESEARCH METHODOLOGY

Three of the authors have been working with an engineering institution, which is 30 year old, in state of Maharashtra. The management of the institute runs seven engineering colleges spread at various locations in the state of Maharashtra. Two of them have been established since 2011 and three since 2012. Whereas one more institution is of 12 year old. In all five hundred teachers are currently employed in these institutions. These teachers are available for interaction with the researchers.

Authors have interacted with all the new teachers recruited in past two decades. Induction training workshops were conducted for the entire new faculty recruited for the five newly established institutes. These workshops and such workshops conducted in the earlier years, has formed the basis of hypothesis.

The research methodology consists of collecting the data about perceived qualities of teachers, identifying most important qualities of teacher which would lead to better teaching learning process (better results and employable as the outcome) segregating measurable characteristics from such a qualities and then designing of a questionnaire for the feedback from the students, implement the feedback process and monitor performance index (PI) on monthly basis to check university examination results at the end of an academic year.

A. Implementation

In order to enhance understanding of the fresh teachers and to carry out their induction training, the authors have conducted training programs for such teachers at several institutions, spread over various locations in the geographical area in the State of Maharashtra, where 367 institutions have been so far established with an intake of over One Lac fifty five thousand of undergraduate degree level.

During the training, the following questions were posed to the participating teachers:

1. Do you remember any of your teachers who taught you during your studies?
2. Why do you remember them? What were their qualities due to which you remember them?

The following key words, indicating such qualities, emerged:

Confident, Understanding, Knowledgeable, Inspiring, Generating interest, Punctuality, Should understand his own mistakes, Neatness, Body language, Communication skills, Imagination, Responsible behavior, Patient, Well prepared, Good planner, Will to teach, Dedication, Friendly, Devotion, Logical thinking, Regularity, Discipline, Good Reader, Character, Polite, Hardworking, Eagar to learn new things, Result Oriented, Motivator, Impartial, Helper, Social, Leadership, Good Listener, Mentor, Good guide / counselor, Ethical, Spiritual, Pleasant personality, Interactive, Honest, Frank, Caring, Innovative, Humorous, Cheerful, Lovable Person, Positive attitude, Adaptive, Flexible, Visionary, Student Centric . The teacher participants were then asked individually, to rank ten important qualities / parameters to ensure better teaching-learning process. Groups were randomly formed and the groups were asked to prepare ten important qualities, which every teacher must possess, to get better examination results of the students at common University examinations. The characteristics emerged as follows: Knowledge, communication skills, punctuality, regularity, discipline, friendly behavior, innovative, right attitude, student centric, researcher, devoted, motivator, impartial, sincere, honest, etc.

In order to create more understanding amongst teachers and learners and to offer an opportunity for improvement in the teaching learning process to the teachers, a feedback form was developed, to seek feedback from all the students about measurable qualities / parameters of teaching of every individual teacher. The feedback sessions were conducted at the end of every four weeks of teaching, i.e. minimum two or three times in a semester. The format implemented at some of the institutions is as follows:

B. Format for appriasal of faculty by students

Name of the Institute

Name of the Faculty :	
Name of the course (Theory/ Practical/ Term work) :	
Class & Division:	Date :

Note: Rational for the feedback: Dear students, this feedback would allow a teacher to consider your suggestions and make necessary improvements in his/her teaching, if required. It will encourage better teachers to become the best. It is necessary that every student should give his/her opinion, here below, without any prejudice. Please respond to all the points by putting a tick mark to the appropriate option below.

Q.	Weightage →	5	3	1
Q.1	Has the teacher given you the lesson plan for the entire semester in the first week	Yes	No	Don't Know

	of teaching?			
Q.2	Has the teacher given you question bank for the forthcoming class-test, in advance?	Yes	No	Don't Know
Q.3	Does the teacher conduct the class exactly as per the time table?	Always	Many times	Sometimes
Q.4	Does the teacher engage all classes regularly?	Always	Many times	Sometimes
Q.5	How is the handwriting / drawing of the teacher on the blackboard?	Good	Average	Poor
Q.6	Does the teacher interact with you in the class?	Always	Many times	Sometimes
Q.7	Is the teacher audible in the class?	Very much	OK	Poor
Q.8	Does the teacher explain the concepts to you properly?	Always	Many times	Sometimes
Q.9	Has the teacher completed lessons as per the plan given to you?	Yes	No	Don't Know
Q.10	How do you rate his / her teaching?	Good	Average	Poor

A student is free to make any comment here:

_____

_____

… End of the format …

In order to judge the performance of a teacher on the basis of the Key Performance Indicators, identified as a part of feedback, a following scheme was introduced.

C. Scheme:

Following is the scheme to monitor the academic progress of an institution.

Following are the points for consideration as Key Performance Indicators (KPI).

1. Lecture schedule – The Head of the Institute (HOI) is expected to issue a time table to all the students and staff right from the commencement of the semester. HOI is expected to keep track of number of lectures scheduled against actually engaged on a daily basis per class and on weekly basis per subject, course, staff and class.
2. Attendance – The HOI will organize to record the attendance of all the students attending lectures / practicals / term work. The record of the attendance for each subject and for every student is to be maintained on a daily, weekly and monthly basis.
3. Lesson plans – All the faculty teaching various subjects / practicals / term work are supposed to prepare, submit and announce their lesson plan for the course work at the commencement of each semester. The HOI will organize to receive the success in terms of percentage of completion of the lesson plans for the individual subject and faculty on a weekly as well as monthly basis.
4. Question bank – The teachers are supposed to go through the University examination question papers for the previous semesters and prepare a question bank on similar lines for every topic in the curriculum of the particular subject. A one hour written test shall be conducted for every subject on a monthly basis and question bank for each examination be separately handed over to the students at the beginning of each semester.

5. Result analysis – After the completion of a semester and when the results of the previous university examinations are available, then, percentage result per course, per faculty, should be prepared.
6. Students' feedback – The performance evaluation of all faculties by the students will be considered as a mandatory requirement for all theory subjects. It should be carried out at the end of each month / four week period. Following are the points on which this appraisal will be carried out, either in hard or soft form. The students will have to choose one of the options for each parameter monitored like Good (5) / Average (3) / Poor (1).
   a. Knowledge
   b. Regularity
   c. Punctuality
   d. Communication skill
   e. Presentation on blackboard.
   f. Interaction during the class.
   g. Effective communication for better understanding of the students.
   h. Satisfactory completion of lessons planned.

D. Procedure for calculation of an index for individual teacher for a particular subject for a particular division:

1. The HOI or HOD (Head of Department) should explain the importance of collecting such a feedback about teachers from the students. The rationale for feedback is given on the feedback from itself. HOI / HOD should urge all the students to attend this feedback session and give their free and frank opinion without any prejudice. The student should be given an assurance that their handwriting would not be divulged to the concerned teachers and no vengeance would be meted out to any student.
2. The hard copy of the feedback form should be circulated to all the students in a class, only for one subject of that class, at a time, by a teacher from any other department.
3. These forms be collected and sealed in a packet and be handed over to the In-charge designated for this work.
4. Performance Index is to be determined for every question separately and average of all ten questions will be the overall Performance Index of the faculty for that particular class and subject.
5. Question-wise index is to be determined as follows.
   T = Total students on roll = x + y + z + r where

   Let us say that for Q.1, 'x' number of students have said (ticked) 'yes/good' (5 marks), 'y' number of students have ticked 'No/Average' (3 marks) , 'z' number of students have ticked 'Don't know/poor' (1 mark), and 'r' number of students were absent at the time of feedback, then, the faculty index for Q.1 (I_1) will be :

$$I1 = \frac{\sum 5x + 3y + 1z + 0r}{5(\text{Strength of a class or students on roll [T]})} \times 100$$

E. Execution

This scheme has been accepted by the Management of the institute and has been scrupulously followed using online feedback system. Table 2 depicts example of feedback and the improvement in PI due to corrective actions taken by the teacher as well as institute after first feedback. The calculation is presented with total strength of class and number of students present for two consecutive feedback sessions.

Strength of Class = T = 72; Students present for first feedback = 62 and absent = r = 10; Students present for second feedback = 65 and absent = 7.

Calculation of PI:

$$PI = \frac{\sum (5 * 33) + (3 * 20) + (1 * 9) + (0 * 10)}{(5 * 72)} \times 100$$

$$PI = \frac{234}{360} * 100 = 65\%$$

With the same procedure the PI for second feedback is also calculated. Column 3 of table 2 represents PI after corrective actions based on feedback 1.

Table 2: Performance Index of a Teacher

Question No.	First Feedback	Second Feedback
1	65.00	68.61
2	68.33	74.17
3	71.66	74.83
4	55.00	68.05
5	53.88	62.5
6	64.44	71.94
7	81.66	80.83
8	77.77	81.38
9	52.77	63.05
10	69.44	75.83
Aggregate PI	66.00	72.55

The results of the academic monitoring process for all teachers have been complied and are presented below as per Table 3:

Table 3: Performance Index of all the faculty for academic year 2013-14

S. N.	Teacher	Class	Sem.	Subject Taught	P.I.		Class Strength
					P.I.-I	P.I.-II	
1	T 1	F.E. A-1	I	Maths-I	85.60	86.30	21
		S.E.-Comp.	II	Maths-III	89.71	88.20	43
		S.E.-E & TC	II	Maths-III	92.44	85.56	27
		S.E.-Mech-B	I	Maths-III	84.90	86.60	67
2	T 2	F.E. A-2	I	Maths-I	78.77	87.00	25
		F.E. B-3	I	Maths-I	67.70	70.36	15
3	T-3	F.E. A-3	I	Maths-I	58.30	62.40	24
		F.E.-B	II	Maths-II	77.03	37.68	63
		S.E.-Civil-	I	Maths-III	83.2	79.13	52
4	T 4	F.E-B 1	I	Maths-I	63.8	68.00	24
		F.E-B 2	I	Maths-I	64.8	64.30	25
		F.E-A	II	Maths-II	76.68	75.29	70
		S.E-Mech-A	I	Maths-III	65.4	70.10	75
5	T 5	F.E-A	I	Physics	60.2	85.60	70
6	T 6	F.E-B	II	Physics	32.8	37.39	63
7	T 7		I	Basic Elex.	81.8	81.60	70
		F.E-B	II	Basic Elex.	65.83	40.98	63
		S.E.-E & TC	I	Signal System	72.65	65.00	27
		S.E.-E & TC	II	Control Sys.	81.74	77.04	27
8	T 8	F.E.-A	I	Basic civil	64.8	77.80	70
		F.E-B	II	Engg.Mechanics	37.98	53.73	63
		S.E.-Civil	II	S.A.-I	72.56	70.29	51
		S.E.-Civil	I	SOM	72.6	91.60	52
9	T 9	F.E-A	I	Engg.Graphics-I	56.61	71.20	70
		F.E-B	I	Engg.Graphics-I	64.8	56.61	64
10	T 10	F.E-B	I	Basic Elect. Engg.	78	69.00	64
		F.E-A	II	Basic Elect. Engg.	81.39	83.61	70
		S.E.-Mech-A	II	E.E.E.	70.57	89.42	72
		S.E.-Mech-B	II	E.E.E.	88.59	90.81	70
11	T 11	F.E-B	I	Chemistry	39.2	38.80	64
12	T 12	F.E-A	II	Chemistry	60.53	70.50	70
13	T 13	F.E-B	I	Basic civil	55	58.00	64
		S.E.-Civil	I	Surveying	68.5	71.60	52
14	T 14	F.E.-A	II	Engg.Mechanics	71	78.00	70
15	T 15	F.E.-A	II	Basic Mech. Engg.	63.2	66.93	70
16	T 16	F.E.-B	II	Basic Mech. Engg.	74.08	43.50	63
		S.E.-Mech.-A	I	F.M.	64.3	62.20	75
17	T 17	S.E.-Civil	I	B.T.M.	73.38	90.70	52
		S.E.-Civil	II	Conc.Tech.	70	71.08	51
18	T 18	S.E.-Civil	I	GTE	72.1	70.96	52
19	T 19	S.E.-Civil	II	F.M.-I	82.73	74.15	51
20	T 20	S.E.-Civil	II	A.P.D.P.	68	66.00	51
21	T 21	S.E.-Civil	II	Geoloogy	83.85	72.37	51
22	T 22	S.E.-Comp.	I	Discri. Struct.	84.02	74.30	44
23	T 23	S.E.-Comp.	I	D.S.P.S.	63.62	60.10	44
		S.E.-Comp.	II	Comp.Graphics	60	56.00	43
24	T 24	S.E.-Comp.	I	D.E.L.D.	68.8	93.00	44
		S.E.-Comp.	II	M.P.I.T.	84.63	84.80	43
		S.E. E& Tc	I	Digital Elex.	64.07	84.55	27
25	T 25	S.E.-Comp.	I	O.S.A.	75.17	75.00	44
		S.E.-Comp.	II	O.O.M.P.	78.77	59.82	43
26	T 26	S.E.-Comp.	I	M.P.A.	41.43	70.00	44
		S.E.-Mech.-A	II	E.E.E.	55.9	77.13	72
		S.E.-Mech.-B	II	E.E.E.	67.37	78.20	70
27	T 27	S.E.-Comp.	I	Comp.Org.	86.59	81.27	43

		S.E. E& Tc	I	D.S.A.	53.27	70.29	27
28		S.E. E& Tc	I	E.D.C.	55.93	76.35	27
	T 28	S.E. E& Tc	I	NetWork Theory	52.83	56.36	27
		S.E. E& Tc	II	Analog Comm.	76.11	83.78	27
29	T 29	S.E. E& Tc	II	I.C.	73.38	75.74	27
30	T 30	S.E. E& Tc	II	Comp.Org.	77.23	77.41	27
31		S.E.-Mech-A	I	M.P.-I	43.2	58.90	75
		S.E.-Mech-B	I	M.P.-I	62.2	64.80	67
		S.E.-Mech-A	II	Metallurgy	39.79	65.97	72
	T 31	S.E.-Mech-B	II	Metallurgy	60.82	70.97	70
		S.E.-Mech-A	I	Material Science	49.73	25.50	75
		S.E.-Mech-B	I	Material Science	65.88	50.26	67
32		S.E.-Mech-A	I	Thermodynamics	75.1	78.80	67
	T 32	S.E.-Mech-A	II	SOM	46.6	67.87	72
		S.E.-Mech-B	II	SOM	68.12	72.83	70
33	T 33	S.E.-Mech-B	I	F.M.	63	62.20	67
34	T 34	S.E.-Mech-A	II	TOM-I	53.55	57.34	72
		S.E.-Mech-B	II	TOM-I	51.38	55.58	70
35	T 35	S.E.-Mech-A	II	Applied Thermo.	66	88.28	72
		S.E.-Mech-B	II		82.36	81.47	70

V: OBSERVATIONS

1. A teacher may be teaching different subjects at different levels (first year, second year,… etc. of Engineering) or divisions and may have different PI for each individual division.
2. PI is an indicator irrespective of difficulty level of understanding a subject by the student.
3. Any teacher understands the area of improvement expected by the students,
4. Immediate corrective action by the teachers will help them to improve their PI immediately in the subsequent feedback.

CONCLUSIONS

1. Measurable characteristics/qualities of teacher are identified.
2. Feedback from the students reflects the implementation of teaching leaning process.
3. PI is an indicator of perception of the students about the teaching ability of the teacher.
4. It is possible to train / counsel the teachers to improve their PI.

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BIOGRAPHY

Prakash Kulkarni is an Associate Professor and Master of Engineering Civil Engineering in Vishwakarma Institute of Technology, Pune, INDIA and research scholar of Tilak Maharashtra Vidyapeeth , Pune, INDIA having 28 years teaching experience. He has been on various positions including principal for two engineering colleges run by Bansilal Ramnath Agarwal Charitable Trust. He was instrumental for successful implementation of "Technical Education Quality Improvement Program" (TEQIP) , a project funded by World Bank at Vishwakarma Institute of Technology, Pune, INDIA. Also he is a key resource person for conducting induction program for newly joined teachers at Vishwakarma Institutes.

Hemant Abhyankar is currently working as Vice President of Vishwakarma Institutes, Pune, INDIA. In 1994, he took up the charge of Principal at Vishwakarma Institute of Technology, Pune. Since then, the academic and extracurricular growth of the institute is continuously on the rise. The Institute has become one of the premier autonomous institutions in the country. In the year 1999, a maiden award was

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Ashutosh Kulkarni, is working as faculty in Department of Computer Engineering of Vishwakarma Institute of Technology, Pune, INDIA and also research scholar at Tilak Maharashtra Vidyapeeth, Pune, INDIA. During his experience, he is involved in various administrative activities like internal auditor for ISO, academic auditor, resource person for induction training to newly joined staff at Vishwakarma Institutes etc. He has published 2 national and 7 international papers in well known conferences and journals. Having an objective of career planning of MCA students, he has started 'Self Development Program' for MCA students to improve their employability. He has been awarded for 'Best Lesson Plan' in the workshop "ICT enabled student centric teaching learning process" organized by Vidya Pratishthan, Baramati and Great Foundation, Pune, INDIA.

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A guideline for the Management of Institutes for enhancing career opportunities of fresh graduates of MCA

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Abstract

As Information Technology (IT) and IT Enabled Services (ITES) are booming in India, since 1998, many jobs are offered by this industry. The Indian middle income group is very large and the aspiring children from such families would like to seek jobs immediately after their education. The Government of India began to offer Computer Education to the Science and Commerce graduates to fulfill the increased manpower requirement in the mid eighties. The Master of Computer Application (MCA) program was introduced as a continuation of this process. A lot of institutions are now offering the MCA program but these students have to compete with engineering undergraduates for a job.

This paper offers insights to the management and academia of MCA institutes about the inputs required by the industry for such students as well as the hands-on competencies to be acquired by MCA graduates for getting jobs quickly.

Keywords: *Management perspective, criteria, employability, campus placement*

1. Introduction

The journey of the Indian software industry has been a remarkable one. It was initiated by Tata Consulting Services (TCS), in the early seventies. In the mid-seventies IBM entered the business in India. The change of millennium "Y2K" was a boost to the Indian IT industry in 1998. Since 2003 India became a primary destination for offshore outsourcing. A survey of undergraduate (UG) engineering students has shown that a majority of them prefer to seek admission to institutions which can offer placement in jobs[1] immediately after their UG studies. Government of India introduced a Master of Computer Applications (MCA) program to increase the manpower pool for IT/ITES industry by giving additional enabling inputs to Science and Commerce undergraduates and by offering training in computer education[2]. Now, these MCA students have to compete with engineering UGs for getting jobs. Industry always looks for a pool of candidates having the knowledge of core subjects and value added skills, if any. From an institute's point of view, one of the real challenges is to groom such industry-ready

graduates within the present or traditional educational system, to satisfy industry needs. A large number of IT graduates are available every year from different universities, but NASSCOM[3] claims that very few IT graduates are employable, in addition, ministry of Human Resource and Development, New Delhi released a report which supports this view expressed by NASSCOM. The objective of this research is to identify factors that can improve employability of MCA graduates and offer guidelines to the management of such institutions running these programs to groom industry ready-graduates. The work is carried out in the city of Pune, located in the state of Maharashtra which has 144 institutes offering MCA program with an intake of 25939 students out of which 58 institutes are affiliated to University of Pune alone, with an intake of more than 7000 students[4].

2. Literature Survey

A publication[5] by Federation of Indian Chambers of Commerce & Industry about Industry – Academia Convergence on "How to bridge the skill gaps (FICCI, 2004)" suggested that institutions need to focus on ensuring a curriculum to adapt quickly to the technological changes in IT/ITES industry. They have also proposed to develop learning models, jointly with the Industry. In continuation, they have suggested an alumni interaction for the development of curriculum. It is recommended that the curriculum should be finalized in consultation with industry experts and be reviewed frequently.

"National Employability Report – Engineering Graduates"[6] (Aspiring Minds, 2011) claimed that maximum efforts are required to be taken to improve programming, logical and quantitative ability of the fresh graduates as well as their ability to communicate in English. A survey[6] of top 100 institutions across India indicates that job opportunities offered in IT product industry fall from 8.44% to 2.17% and the same in IT Service industry falls by 30.95% to 16.32% due to lack of required skills.

Policy Research Working Paper based on survey[7] (Andreas et al., 2011) "Employability and Skill Set of Newly Graduated Engineers in India." suggested that institutes providing technical education programmes in India should seek to improve the skill set of graduates and shift the focus toward higher-order skills and creativity.

The World Bank South Asia Region Education Team (Andreas Blom et al, 2011) has identified skills by factor analysis. The team found that employers perceive Soft Skills (Core Employability Skills and Communication Skills) to be very important. These findings suggest that engineering education institutions should seek to improve the skill set of graduates, recognize the importance of Soft Skills and revise their assessment schemes as well as the teaching-learning process. In line with this, they also suggested to prepare the curriculum away from traditional thinking skills, such as remembering and understanding, and move towards higher-order skills,

such as analyzing and logical abilities to solve engineering problems, as well as creativity; and interact more with employers to understand the particular demand for skills in that region and sector.

An interim report[8] "Human Resource and Skill Requirements in the IT and ITES Sector - A Study on mapping of human resource skill gaps in India till 2022" by National Skill Development Corporation (NSDC) mentioned the following skill gaps among fresh graduates aspiring for jobs, at the time of recruitment: i) Inability to 'deep-dive' into a particular language/technology platform as experience level increases, ii) Inadequate soft skills, especially when it comes to interacting with the client , iii) Inadequate knowledge of corporate culture – reporting, compliance, escalations, e-mail etiquette and protocols, iv) Inability to understand their role as a 'Software Engineer' (they perceive it more as a 'programmer' which results in to gaps in 'systems approach/thinking'. v) Poor awareness of concepts of Software Engineering based on the trends witnessed in productivity and the growth potential of the IT and ITES industry in India, NSDC also claims that the industry would need about 7.5 million persons by 2022. NSDC with the association of ICRA Management Consulting Services Limited suggested potential areas for skill building amongst fresh graduates which are - logical thinking and problem solving, demand driven programming languages, training in project management, training of business analysis like UML, Rational Rose, and soft skills (including communication).

In the publication[9], "A study on competency needs analysis and quality factors for fresh recruits" it is concluded that companies innovate various strategies to identify and recognize the requirement competencies amongst fresh and potentially eligible candidates. Among all other criteria of employability, communication skills rank at the top.

TeamLease Services India Labour Report[10] (2012) noted that curricula to be formulated keeping in view the necessity of both domain skills and life skills. The term, skill, is an n-dimensional concept, as most jobs need a combination of skills for adequate performance. It includes physical abilities, cognitive thinking and interpersonal orientation.

In the publication[11], "Career Development Challenges in Front of MCA Institutes in Pune Region… A Management Perspective" (Ashutosh Kulkarni et al.) suggested that an interaction to understand needs with IT/ITES industries will not only provide the methods for an effective teaching learning process but will also give the inputs to improve employability. In fact, it is a part of the need to design a set of guidelines / model for the management or administrators of institutes to improve their student's employability.

In the publication[12], "Employability of Management Students In India: Some Concerns and Considerations" (Dhar, 2012) suggested that if the members of the alumni are successfully placed in different reputed organizations including blue chip companies as well as multi-national corporations, and if they are working either as middle or senior level managers, then words of mouth publicity, due to such alumni, will fetch more and more jobs to the students of

their institution. The companies will come to recruit in bulk from such branded campuses as they presume they are getting better candidates.

In the publication[13], "IT/ITES Industry Perspectives on Improving Fresher's Employability – A Case Study" (Ashutosh Kulkarni et. al, 2013) suggested that the spectrum of IT/ITES industry is very wide, it is necessary to pinpoint the specific technical skills, the common minimum technical and logical abilities that every fresher must acquire. And therefore a macro level survey for important parameters as identified in the survey is necessary.

3. Need and Significance

Indian Universities are established either by the central or state Governments in India, (since British Rule, in the nineteenth century) and all colleges/ institutes in a geographical proximity (as defined by the Government) are "affiliated" to these Universities. This is a unique system under which hundreds of colleges are affiliated to Universities like Mumbai or Pune University. The students study in affiliated colleges / institutes but have to appear for their semester or annual examinations conducted by the affiliating university, which offers the students degrees/ diplomas on successful completion of a program. The curriculum, which is common to all institutions under a particular University and is designed at the University level, has become very rigid and changes can take place only after five to seven years, with the opportunity to adapt to changing industrial requirements thus lost. In India, for non-engineering graduates, the MCA programme offers an opportunity to become eligible to work with IT/ITES industry. Presently, due to high competition, IT industries recruit only such fresh candidates who need less or no further in-house training. It has put pressure on academic institutions to prepare graduates with relevant inputs. Since large numbers of fresher graduates are available, IT/ITES industries are expecting additional skills with the available fresh graduates to develop which certain additional efforts have to be taken by the management of the institutes. About ninety percent candidates study in Institutes which are run by private Trusts, where education is cost based, that is the entire cost is recovered through tuition fees charged to the students and the Government does not offer any subsidy. The admissions to these Institutions are done by the Government through a centralised system and students are free to choose an Institute. Eventually those Institutes which offer better placement in jobs to their students get better students or at least get enough students to recover the cost of education. This research presents the expectations of the recruiting companies from fresh graduates, as well as a guideline to the management of the institutes to enhance on-campus recruitment opportunities for their out-going graduates.

4. Goals

Goals of this research are therefore, defined as

- To identify the attributes of fresh MCA graduates as expected by IT/ITES industry, at present.
- Based on these expectations, to study and identify the gap in the teaching – learning process, with reference to the currently existing curricula of various universities in Maharashtra.

5. Methodology

The authors have used the following research methodology:

I. Interaction with senior HR-officials of IT/ITES Industry in Pune Region.
II. Designed a questionnaire to understand various attributes of the fresh graduates, at the time of recruitment, by the recruiting IT/ITES industry in Pune Region.
III. Circulated the questionnaire and collected the data from senior HR officials of IT/ITES industry from Pune Region.
IV. Understood the expectations in terms of both technology and softskills.
V. Compared the existing curricula of Universities in the state of Maharashtra to identify the gaps.

Survey Questionnaire for IT/ITES Industry

Pune, is an industrial hub in the western region of India and has a large number of IT/ITES companies employing huge manpower. On the basis of initial interaction and interview with a few senior experts and recruiters from IT/ITES industry, a questionnaire was designed.

This questionnaire was circulated to HR experts, who were requested to choose most preferred alternative as an answer to the question. Authors visited 55 leading IT/ITES industries in and around Pune city in Maharashtra, India and conducted the survey from 183 participants with different job profiles who are working in the industry and whose work experience range from 2 years to 15 years.

The questionnaire designed and circulated to experts had four alternative answers to the first ten questions from which experts have to choose one. The last, eleventh question asks the experts to rank the attributes or characteristics of the fresh graduates to which they offer preference while recruiting. The highest preference is rank one.

Outcome of IT/ITES Survey

Table 1 depicts the summary of answers to the first ten questions asked to the IT/ITES experts, where column-1 shows the question and its alternative answers, column-2 gives their answers in terms of percentage for the alternatives chosen, and the third column presents the perception of the authors , as an observation.

Table 1: Survey with the IT/ITES Industry

Question asked	Answers in %	Observations
Most preferred qualification of fresh candidate as fresher		
(a) Engineering Graduate	(a) 78%	IT/ITES industry prefers Engineering Graduates but has inclination to accept fresh MCA graduate too.
(b) Post Graduate in Engineering	(b) 4%	
(c) MCA	(c) 15%	
(d) Graduate in other discipline	(d) 3%	
Expected consistency in academic performance of MCA as fresh graduate		
(a) Consistently high from 10th standard.	(a) 30%	
(b) Above average from 10th standard.	(b) 24%	Good academic record is important.
(c) Consistent first class in MCA	(c) 38%	
(d) First class in MCA final Year	(d) 8%	
Higher priority while recruiting MCA graduate		
(a) Oral Presentation	(a) 13%	Technical Knowledge plays a vital role.
(b) Technical Presentation	(b) 74%	
(c) Written Communication	(c) 1%	
(d) Academic Performance	(d) 12%	
Preferred technical competency		
(a) Technology Development	(a) 90%	The IT industry prefers skills for Technology Development.
(b) Assets Management	(b) 2%	
(c) Release Management	(c) 3%	
(d) Maintenance	(d) 5%	
Knowledge of Development themes, useful for an enterprise		
(a) System Programming	(a) 11%	
(b) Application Programming	(b) 79%	Fresh graduate should predominantly

(c) Scripting and Interfacing (d) Higher Order Language	(c) 7% (d) 3%	acquire knowledge of Application Programming
Development themes expected from MCA graduates (a) Module Based (b) Component Based (c) Pattern Based (d) Framework Based	 (a) 30% (b) 21% (c) 7% (d) 42%	 Industry expects curriculum to focus on a variety of Development Themes.
Better hands-on practice expected at institute level (a) Lab Assignments (b) Mini Projects (c) Group Assignments (d) Individual Projects	 (a) 9% (b) 45% (c) 11% (d) 35%	 Carrying out a Mini Project is the best practice.
Best way to create awareness about the ongoing practices in the IT/ITES sector (a) Lectures by industry expert (b) Assignments on articles of current trends (c) Regular guidance by alumni (d) Awareness visits to industry	 (a) 54% (b) 20% (c) 11% (d) 15%	 Lectures by experts from Industry are strongly recommended.
Preferred Co-curricular activities institute must adapt (a) Presentation in seminar (b) Paper publication in conference (c) Participation in technical competition (d) Short-term internship in an enterprise	 (a) 8% (b) 4% (c) 24% (d) 64%	 Short Term internship with an enterprise is necessary.

Current trend of retention (a) B.E/B.Tech (b) M.E/M.Tech (c) MCA (d) Other graduates	 (a) 63% (b) 6% (c) 25% (d) 6%	MCA graduates tend to change their jobs.

Having analysed the experts' replies to the first ten questions of the questionnaire above, the answer to the eleventh question has been presented below.

Question 11 : In general, for the recruitment of a fresh MCA graduate, how would you rank (for preference) their following parameters?

Kindly rate them from 1 to 10 (in order of your preference). **[Please do not repeat the rank.]**

Rank 1 – Highest Rank to the most preferred parameter

Higher Rank (Lower Number) signifies more importance to the parameter, from recruitment point of view, in comparison to the remaining once.

Rank 10 – Lowest rank to the least important

Parameter	**Rank**
Attitude	
Awareness of current trends	
Communication Skills	
Hands-on Experience	
Local Candidate	
Overall Personality	
Physical Fitness	
Problem Solving approach	
Strong Fundamentals	
Technical Knowledge	

In response to Question 11, the participants were requested to rank their preference to the attributes expected with fresh candidates, indicated as parameters in the question. Ranking was to be done from 1 to 10 where Rank 1 is the highest rank indicating the most preferred parameter and Rank 10 indicating the least preferred one. 166 participants have offered their ranking.

Table 2 : Ranking of parameters by IT/ITES industry

Parameter	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	Rank 7	Rank 8	Rank 9	Rank 10
Attitude	37	16	19	30	15	19	18	7	2	3
Awareness Of Current Trends	2	0	6	18	30	39	40	22	6	3
Communication Skills	5	16	17	28	39	40	13	6	0	2
Hands-On Experience	9	8	11	25	24	33	32	11	11	2
Local Candidate	7	1	0	1	3	2	3	18	32	99
Overall Personality	3	0	5	6	6	10	39	61	32	4
Physical Fitness	1	7	0	1	4	4	6	27	73	43
Problem Solving Approach	19	30	48	30	18	4	4	7	3	3
Strong Fundamentals	44	43	28	13	12	8	6	2	6	4
Technical Knowledge	39	45	32	14	15	7	5	5	1	3

This table is analysed using a simple method of decision making i.e. marks from 9 to 0 are given in the descending order for rank one to rank 10 respectively and the overall preference to each attribute / parameter is calculated in terms of percentage. Table 3 shows the marks to each rank and the overall percentage for each attribute.

Table 3: % ranking of parameters by IT/ITES industry

Parameter	R1* 9	R2* 8	R3* 7	R4* 6	R5* 5	R6* 4	R7* 3	R8* 2	R9* 1	R10* 0	% Ranking
Attitude	333	128	133	180	75	76	54	14	2	0	66 %
Awareness Of Current Trends	18	0	42	108	150	156	120	44	6	0	43 %
Communication Skills	45	128	119	168	195	160	39	12	0	0	58 %
Hands-On Experience	81	64	77	150	120	132	96	22	11	0	50 %
Local Candidate	63	8	0	6	15	8	9	36	32	0	12 %
Overall Personality	27	0	35	36	30	40	117	122	32	0	29 %
Physical Fitness	9	56	0	6	20	16	18	54	73	0	17 %
Problem Solving	171	240	336	180	90	16	24	14	3	0	72 %

Approach											
Strong Fundamentals	396	344	196	104	60	32	18	4	6	0	78 %
Technical Knowledge	351	360	224	98	75	28	15	10	1	0	77 %

$$\%\,Ranking = \frac{\sum (R1 * 9 + R2 * 8 + \ldots + R10 * 0)}{(\text{No. of Participants}) * 9}$$

It means,

Parameter	Rank %
Strong Fundamentals	16 %
Technical Knowledge	15 %
Problem Solving Approach	14 %
Attitude	13 %
Communication Skills	12 %
Hands-on Experience	10 %
Awareness of Current Trends	9 %
Overall Personality	6 %
Physical Fitness	3 %
Local Candidate	2 %
Total	**100%**

Observation:

The recruiters give high preference to the Knowledge Acquired, Attitude and Soft Skills.

6. Comparison of Existing Curricula

In order to understand whether the current curriculum of a university can inculcate all the attributes expected by the IT/ITES industry amongst fresh MCA graduates, by providing them with the necessary inputs, a study was carried out for six universities in the state of Maharashtra. The observation are as follows:

In general, the MCA curriculum is for three years spread into six semesters. It has the structure of administering the contents, examining scheme, the marks assigned to theory / practical examination , term-work etc.

The inputs for enabling the graduate with IT/ITES skills, though various subjects to be taught during this program, have been classified into four segments and the curricula is then compared with the expectations of the IT/ITES industry to find out if it can offer adequate inputs.

i. Core Courses: Courses which are discipline specific and must be learned by all students for core computing knowledge building. It includes the subject disciplines such as

Computer Architecture, Data Structures, Theory of Computer Science, Computer Networks and Database Management System.

ii. Fundamental Development Courses: Courses required for practicing the concepts in theory by using different language and development paradigms. It includes the courses like System Development Programming, Application Programming, Scripting Languages and Higher Order Programming.

iii. Technology Realization Courses: Courses required knowing the different development styles used in industry. It includes the courses elaborating on Module based Development, Component based Development, Pattern-based Development and Framework-based Development.

iv. Workforce Skill Development Courses: Courses required for enhancing the apprenticeship and employee skills projection like soft skills, mini projects and short term internship.

Authors have studied and compared the curriculum offered by the following viz. Mumbai University (A), Pune University (B), SNDT University (C), Dr. Babasaheb Ambedkar Marathwada University (D), Amravati University (E) and Shivaji University (F).

Table 4 depicts the comparison matrix indicating the gap in expected attributes and necessary inputs to inculcate them amongst fresh graduates. It is found that the curriculum in all these universities does take adequate care to cover desired core courses. The gap analysis for the other points under focus reveals the following. The notation (√) represents existence of the courses and the notation (X) represents non- existence of the courses.

Table 4 : Comparison of existing curriculum

Parameters	University A	University B	University C	University D	University E	University F
System Development Programming	X	√	√	√	X	√
Application Programming	√	√	√	X	√	√
Scripting Languages	X	√	√	√	X	X
Higher Order Programming	√	√	X	√	√	X
Module based Development	√	√	X	√	X	√
Component based Development	√	√	√	√	√	√
Pattern based Development	√	√	X	X	√	√

Framework based Development	√	X	X	X	X	X
Soft skills	√	√	√	√	√	√
Mini Project	X	√	X	X	√	√
Short Term Internship	X	X	X	X	X	X

Following are the observations.

- The study suggests that emphasis is given on development of Core Competencies.
- Universities A and E do not offer System Development Programming.
- University D does not offer Application Programming.
- Universities A, E, and F do not offer Scripting Languages.
- Universities C and F are not offering Higher Order Programming languages.
- Universities C and E have not included Component Based Development.
- Universities C and D have not included Pattern Based Development.
- Universities B, C, D, E, F have not offered emphasis on Framework Based Development.
- Mini Projects are not included in Universities A, C and D.
- And under all universities, there is no provision for additional short term internship.
- However all universities have made a common provision for project work of six months duration.
- It is observed that the change in curriculum takes place on an average after three years.

7. Conclusion

The study has provided salient features of an employable fresh graduate and also gives us university-wise deficiency in the curriculum for acquiring adequate technical competency. With this background, the following steps are proposed for the management of such technical institutes which run an MCA program.

On campus recruitment of fresh graduates is a basic necessity for any institution to attract better students for admission. In fact, the students choose to select an institute only if it has a track record of inviting industry to the campus for recruitment. In order to ensure admissions to the fullest of the sanctioned intake, the management has to make efforts to make their students employable. Out of the then characteristics (parameters) of the employable graduates, the top two parameters are strong fundamentals and adequate technical knowledge. These are followed with a problem solving approach, attitude and communication skills.

The top two are dependent on the curriculum set by the respective university and the academic rigor for implementing the teaching-learning process at a particular institute. The management of the institute can think of achieving academic autonomy to gain total control over the

curriculum, which is a lengthy process and is totally dependent on the enthusiasm of the teachers working in the institute.

The parameters like a problem solving approach and attitude of the students will have to be carefully nurtured at institute level, right from day one.

The language skill and communication skill have also become a part of their attitude for the students where additional efforts are required to be made from time to time.

8. Guidelines

In the last five years, the world economy has slowed down and a large number of youth remain unemployed. The intake of engineering colleges has substantially increased in the last decade, enhancing the competition to MCA graduates for employability. As their employability is decreasing, the seats in MCA institutes have been remaining vacant and the management of these institutes are facing financial crunch. These managements need guidance to take steps to improve the employability of their graduating students, thereby improving the admission status.

The authors have proposed a stepwise model to improve the employability.

Step I:

Every institute must identify a senior faculty who can work as an officer for training and placement (TPO) of students and also establish liaison with the surrounding industry. If such a faculty is not available in the institute, the management should identify such a person who could be eligible for such a function and recruit him or her.

Step II:

The institute must establish an Industry Institute Interaction Cell which would be laid by the TPO. Three young energetic faculties can be made a part of this cell who would work under the guidance of the TPO.

Step III:

The cell should enlist all IT/ITES industry within a region of not less 30 kilometres and make an attempt to visit the higher officers in those industries for the interaction. These higher officers' would means a managing director, various client/project heads, and HR manager.

Step IV:

The cell should invite the officials to visit the institute and look into the facilities available with them.

Step V:

The cell should request the above officials to spare their experts for offering guest lectures to their students.

Step VI:

The senior faculty from the institute must visit these industries to know if they can propose mini projects for students.

Step VII:

The management of the institute must take a keen interest in this liaison activity and should provide all the facilities like transport and/or reimbursement for actual cost for all such visits.

Step VIII:

The training of all final year students should be provided by the management preferably free or with substantial subsidies, to improve the language skills and communication skills of the students.

Step IX:

Creating students with a positive attitude would be an important challenge to the management of the institute. Management should take efforts to contact consultants and/or spiritual leaders to undertake programs to their students which could improve their attitude in a positive direction.

All such programs will have to be conducted outside routine college hours and therefore involving the students to participate in such programs would be a task for the management.

Figure 1 depicts measures to be undertaken by the management of the institute.

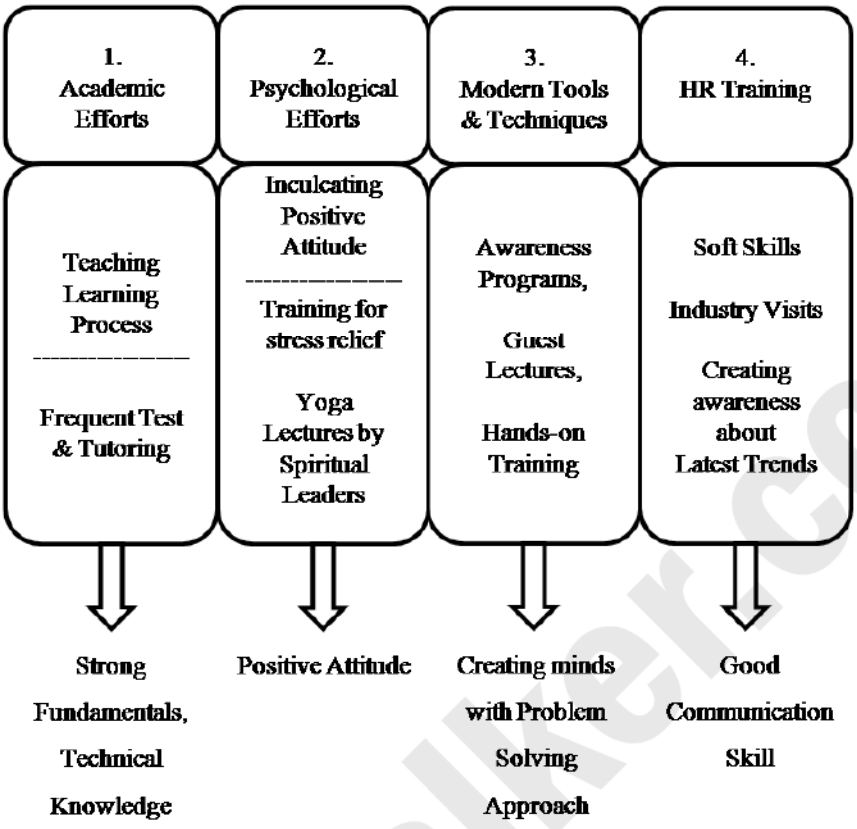

Figure 1: Measures to be undertaken by management of the institute

Step X:

Technical competency is a basic requirement for considering any candidate for recruitment. To ensure, management will have to make efforts in traditional ways as well as with innovative ideas. The traditional ways are as follows:

- Recruit adequate qualified faculty for conducting classes as stipulated by the curriculum.
- Ensure that theory and laboratory classes are held punctually and on a regular basis.
- Attendance of 100% by the students be made mandatory by the management and a mechanism to continuously monitor this be established. As the parents pay the cost of education, the management must make an arrangement to appraise the parents about regularity and sincerity of their wards at all theory and laboratory sessions.

Step XI:

The management should hold regular in-house competitions for the students to work on mini projects.

Step XII:

Management should offer, at reasonable or no extra cost, training of the students in the gap areas identified for their universities.

Step XIII:

Each institute must invite senior officers of nearby IT/ITES industry to be a part of their advisory board, which should be established by all institutes, and regular meetings must be carefully planned for these members to attend on the campus which may also allow them to interact with the students of the institutes.

The above plan of action would work as a model for improving the employability of the students within the institute.

Figure 2 depicts the proposed model.

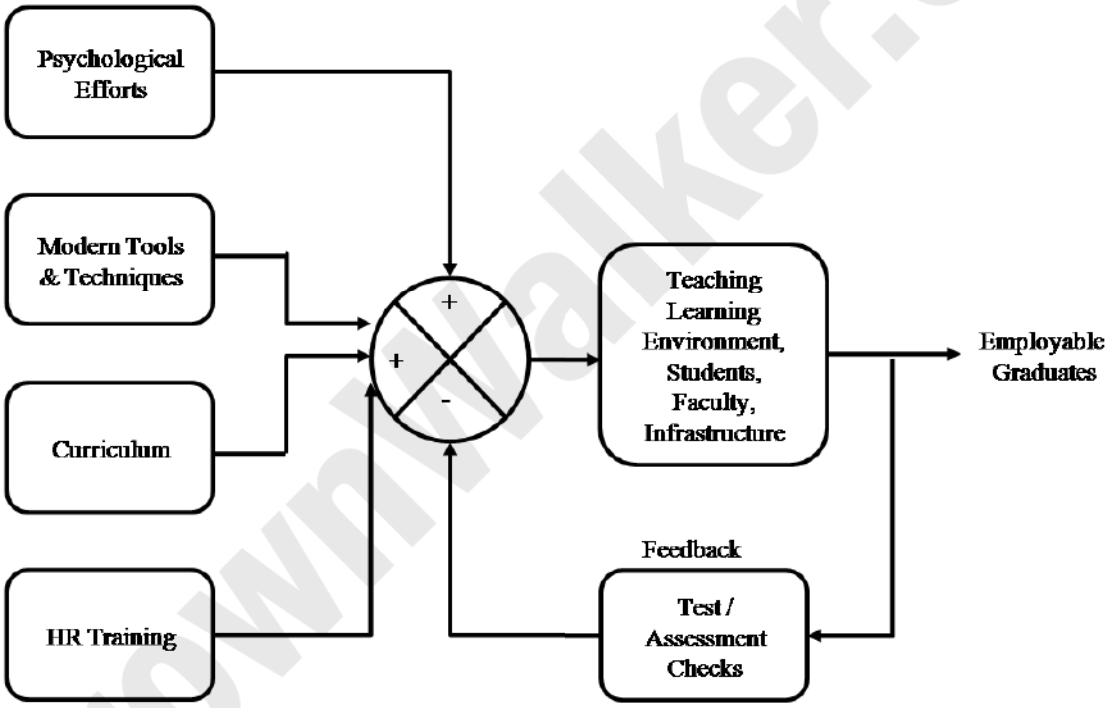

Figure 2: Proposed Model

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Performance Analysis of the Undergraduate Engineering Students on the Basis of Performance at Qualifying Examination in India

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ABSTRACT

It is always a challenge for a teacher to ensure good performance of the students to whom one is teaching a course. All teachers work hard to ensure that they impart subject knowledge equally well to all the students in their class. There is a general tendency of attributing failure of a student in an examination to the inability of the student to cope up with the studies. A non performing student is considered either not capable or not taking enough efforts. The Authors have tried to carry out a study of undergraduate engineering students studying in an institute which has a stable faculty, i.e. the input given to the students is uniform. The paper gives analysis for all the four years of the undergraduate studies in engineering for five consecutive batches of students. In an Indian environment, students undergo a semester system. There are two semesters in each academic year spanning July to June. The integrated result of two semesters taken together decides a failure or pass for each student to go to the next academic year. The annual results are considered for analyzing the data of students on the basis of their performance at the entry level, i.e. the qualifying examination (cut off marks) to seek admission to an undergraduate engineering program of four years duration. All students in a batch are categorized on the basis of their performance at entry level in steps of five percent marks in qualifying examination. The analysis reveals the expectancy for a student to complete the four year program in exactly four academic years on the basis of their cut off marks. The Authors in this paper present an empirical probability factor for successful completion of a UG program on the basis of the cut off marks of the students.

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1. Introduction:

Indian higher education system is not only large but also the most complex one. A large number of private charitable trusts were permitted to open private undergraduate engineering colleges in the country and these institutions have more than 90% of the intake capacity out of Seventeen Lac intake per annum. The quality of education imparted in all these institutions has become a major concern in the country. The components of quality of education consist of the teaching learning process amongst many other factors. For the teaching learning process, apart from the infrastructure, curriculum and qualified teachers, the students play an important role. It is proposed to investigate the effect of quality of student at the time of entry to the undergraduate engineering program on the output in terms of performance of these students during the four years of the program.

2. The Teaching – Learning Process :

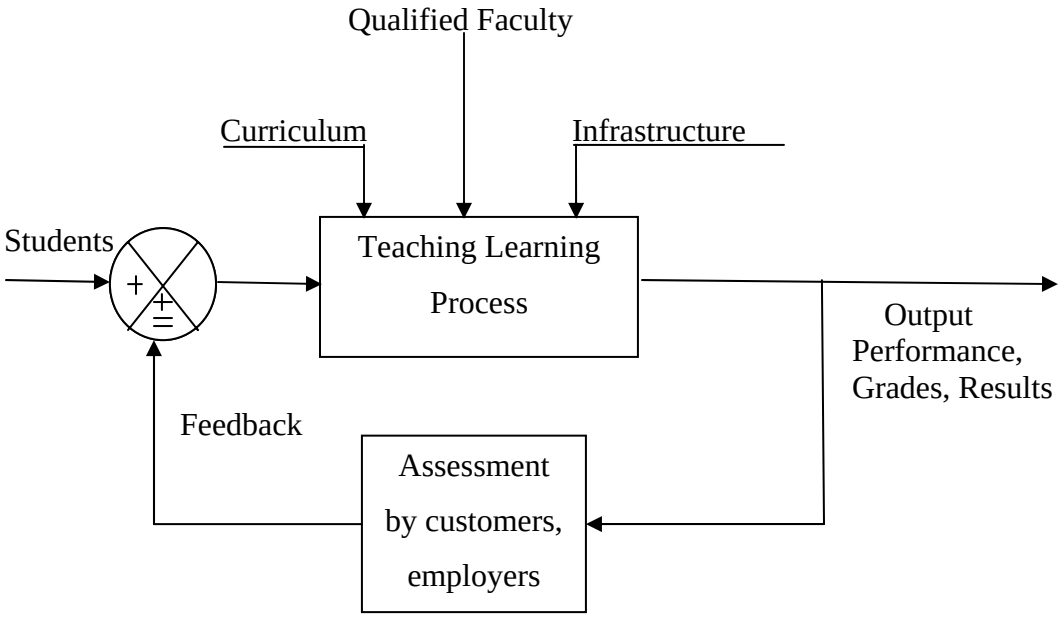

Fig.1 indicates the teaching – learning process in general, where quality of the students at the time of entry, is considered as an input and their performance at the end of four years as the output. The infrastructure, curriculum and qualified teachers is considered as additional input to the process.

Vishwakarma Institute of Technology, Pune (VI, Pune) is one of the leading technical institutions in the country. It was established in 1983 by Bansilal Ramnath Agarwal Charitable Trust and runs nine undergraduate, eight post graduate and six doctoral programs at present. The Institute has adequate qualified faculty which can be considered as a stable faculty. The intake at undergraduate classes was close to 540 from academic year 2001– 02, to 2005 – 06. A comparative study of all the students joining the Institute in the respective years has been made to find out how many students pass out within stipulated four years of undergraduate program. The students may pass or fail in an academic year on the basis of their performance during that academic year.

The admissions to undergraduate engineering colleges to students have been offered by a centralized process by the Govt. The basis for offer of such admission is merit of a student and the merit lists have been prepared initially on the basis of the marks obtained by the students in the subjects of Physics, Chemistry and Mathematics at the Higher Secondary School Certificate Examination (XII^{th}) conducted. Since 2007, the State Govt. of Maharashtra is conducting an entrance test called MHCET. Similar examinations are conducted by other states, Central Govt. AIEEE and by IITs (JEE). Each college has a fixed number of seats, called sanctioned intake by AICTE and a student of higher merit asking a program in an institute gets it first as per his / her choice. The merit list is operated from the top; hence, all higher merit students would be offered seats as per their choice of a program in an institute. The marks obtained by a student who gets the last seat in a program of an institute, is therefore termed as cut off marks. Since students have their choice, their choice could be termed as the perceived quality of education by the students and their parents who pay for them. So higher cut off in an institute means better quality of education is imparted by that institute.

In an Indian environment, students undergo a semester system. There are two semesters in each academic year spanning July to June. The integrated result of two semesters taken together decides a failure or pass for each student to go to the next academic year. The annual results are considered for analyzing the data of students on the basis of their performance at the entry level, i.e. the qualifying examination (cut off marks) to seek admission to an undergraduate engineering program of four years duration. All students in a batch are categorized on the basis of their performance at entry level in steps of five percent marks in qualifying examination. The analysis reveals the expectancy for a student to complete the four year program in exactly four academic years on the basis of their cut off marks. The Authors in this paper present an empirical probability factor for successful completion of a UG program on the basis of the cut off marks of the students.

Table 1 to table 5 (Annexure) show following columns for every academic admission year from 2001-02 to 2004-05. Various columns in the table are as follows –

Column A	PCM % range – i.e. range of percentage of marks at the qualifying examination in the subject of Physics, Chemistry and Mathematics taken together as per eligibility criteria for admission to an engineering program in the state of Maharashtra.
Column B	No. of students who secured admission at VI, Pune for first year engineering program and are having secured percentage of marks in the range stipulated in column A
Column C	Number of students who completed the first year of engineering and joined second year engineering.
Column D	Number of students who completed the second year engineering examinations in the consecutive academic year and joined the third year engineering.
Column E	Number of students who completed the third year engineering examination in the consecutive academic year and joined the final year engineering.
Column F	This is the number of students who have joined the program in column B, passed in all the subjects to acquire the undergraduate degree in Engineering.
Column G	Percentage of number of students who successfully completed the four year engineering undergraduate program in optimum four years. This is termed as Success Rate, which could represent as a quality parameter.

Every row is defined for a range of five percent of marks at qualifying examinations. For example, in table no 1 for academic year 2001-02, there were 88 students who joined VI, Pune with marks in the range of 95%-100% out of these 88, only 83 students completed the four year undergraduate program in four years. Other five students either took more than four years to acquire the degree or dropped out of the program. Similarly out of 11 students who joined VI, Pune with qualifying marks in the range of 50 to 55%, only one student completed the four year UG program in four years and other ten students either took longer time to complete the program or they dropped out later.

3. Observations and conclusion :

Following are the observations made after looking at all the tables:-

1. The institute, its infrastructure, teachers, curriculum is same for all the students. They belong to the same batch, hence teaching-learning, examination and evaluation for all students is under same conditions. Quality parameters, as proposed by National Board of Accreditation (NBA) of AICTE, New Delhi, for the input, remain the same for all the students. As a natural extension, if there are ten students of same marks at qualifying examination (at the time of admission to the institute), we may logically conclude that when academic support and environment is same, their result should

have been the same. That is, if the marks obtained by them in engineering examinations are not same, potentially they should all at least ‘pass’ or ‘fail’ in the examination. However it is not observed so.

2. The tables / graphs are made for the group of students for a range of 5% MARKS IN DESCENDING ORDER. That is starting from a range of qualifying marks of 95% to 100% down to lowest qualifying marks of 45%.

3. The study has been made for five consecutive years of admissions, i.e. Academic Year 2001-02 to Academic Year 2005-06. The results of all students for every consecutive academic year, that is first year (F.E), second year (S.E), third year (T.E) and final year (B.E) has been recorded and presented for their four years of degree course.

4. There is a nonzero strength of students in each span (row) however, the majority of the students are of high percentage of marks at qualifying examinations. This is mainly because few seats in India are reserved for the students on the basis of caste and creed.

5. Although 95% to 100% marks at qualifying examination indicate students of a very high merit in the state of Maharashtra, their result should have been 100% pass, in all the five batches at all the levels of engineering examinations from the first to final year. However, it is observed that, only for the admission batch of academic year 2001-02, the result happens to be 100% at the final year (BE) examinations, i.e. one in sixteen examinations.

6. It is also seen that for a given range of percentage of marks at any admission year, the probability of completing the four year UG program in four years is also not the same for all five batches.

7. Barring the exception of admission year 2001-02, for all batches some students of even the lowest range of qualifying marks have been passing at all the examinations and completing the four year UG program in four years time.

8. Table 6 gives comparative study of the performance of batches admitted for all five academic years.

   Column A gives range of percentage at qualifying examination of the students admitted.
   Column B to F gives percentage of students passing out in four years which is minimum period of the course duration and column G gives average percentage or

probability of a student passing out for the particular range at qualifying examination.

Total average talks about average percentage of the probability of a student joining the institute and passing out in four years. This could be considered as a Quality Index for the particular institute for a particular batch.

9. If these are the observations at an institute of highest choice like VI, Pune, then, we can expect similar (or poor?) results in other private unaided engineering colleges and it could be generalized at even national / state level.

10. In short, success or failure cannot be guaranteed on the basis of marks obtained by a student at the qualifying examination and it is irrespective of range of marks at entry level or at any successive level in engineering examinations.

11. In addition to the infrastructure, qualified faculty and curriculum (i.e. academic ambience in an Institute) if the performance of the students (results in the examination) during four years of a program is an indicator of quality of education at a given institute then, there is a need to identify ways and processes other than standard teaching – learning process to enhance quality of education.

Annexure (Table 1 to 6)

Table 1 :

Academic Year 2001-02 analysis

	TOTAL	FE	SE	TE	BE	% Passing
95-100	88	88	84	83	83	94
90-95	149	147	143	133	129	87
85-90	75	74	69	66	54	72
80-85	66	60	56	50	48	73
75-80	50	44	40	34	32	64
70-75	36	26	20	15	15	42
65-70	25	15	10	9	7	28
60-65	15	9	6	2	1	7
55-60	18	5	3	2	2	11
50-55	11	3	2	1	1	9
45-50	6	1	0	0	0	0
Total	**539**	**472**	**433**	**395**	**372**	**69**

Table 2 :

Academic Year 2002-03 analysis

	TOTAL	FE	SE	TE	BE	% passing
95-100	119	118	117	113	111	93
90-95	146	140	133	131	123	84
85-90	82	75	71	71	68	83
80-85	56	48	40	39	37	66
75-80	48	31	26	25	24	50
70-75	33	26	22	21	21	64
65-70	17	9	6	5	5	29
60-65	18	12	7	3	2	11
55-60	8	4	0	0	0	0
50-55	6	2	0	0	0	0
45-50	4	1	1	1	1	25
TOTAL	**537**	**466**	**423**	**409**	**392**	**73**

Table : 3

Academic Year 2003 - 04 analysis

	TOTAL	FE	SE	TE	BE	% PASSING
95-100	94	92	87	87	86	91
90-95	191	190	184	181	175	92
85-90	76	71	68	67	65	86
80-85	58	56	49	45	37	64
75-80	37	32	29	29	28	76
70-75	30	21	19	17	15	50
65-70	28	20	17	14	12	43
60-65	17	10	7	7	6	35
55-60	11	5	4	4	4	36
50-55	11	4	2	2	2	18
45-50	0	0	0	0	0	0
TOTAL	**553**	**501**	**466**	**453**	**430**	**78**

Table : 4

Academic year 2004-05 analysis

	TOTAL	FE	SE	TE	BE	% PASSING
95-100	77	75	74	74	73	95
90-95	147	147	141	140	139	95
85-90	92	83	77	74	72	78
80-85	57	49	43	42	40	70
75-80	52	38	32	28	27	52
70-75	47	28	28	25	21	45
65-70	30	16	12	8	5	17
60-65	27	14	10	10	9	33
55-60	15	8	6	6	5	33
50-55	12	1	0	0	0	0
45-50	5	2	2	2	1	20
TOTAL	**561**	**461**	**425**	**409**	**392**	**70**

Table : 5

Academic Year 2005-06 analysis

	TOTAL	FE	SE	TE	BE	% passing
95-100	65	64	62	60	60	92
90-95	109	106	103	98	98	90
85-90	86	84	78	73	72	84
80-85	75	65	59	57	57	76
75-80	53	44	41	38	38	72
70-75	46	38	33	26	26	57
65-70	50	36	30	23	23	46
60-65	29	22	15	15	15	52
55-60	19	7	5	5	3	16
50-55	13	7	6	5	4	31
45-50	7	1	1	1	1	14
TOTAL	**552**	**474**	**433**	**401**	**397**	**72**

Table : 6

% range	% Passing					
Batch	2001-02	2002-03	2003-04	2004-05	2005-06	Average
A	**B**	**C**	**D**	**E**	**F**	**G**
95-100	94	93	91	95	92	93
90-95	87	84	92	95	90	89.6
85-90	72	83	86	78	84	80.6
80-85	73	66	64	70	76	69.8
75-80	64	50	76	52	72	62.8
70-75	42	64	50	45	57	51.6
65-70	28	29	43	17	46	32.6
60-65	7	11	35	33	52	27.6
55-60	11	0	36	33	16	19.2
50-55	9	0	18	0	31	11.6
45-50	0	25	0	20	14	11.8
Total Average	**69**	**73**	**78**	**70**	**72**	**72.4**

Career Development Challenges in Front of MCA Institutes in Pune Region … A Management Perspective

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ABSTRACT :

Increasing applications of computers in almost all the areas of human Endeavour has led to a vibrant industry with concurrent rapid changes in technology. After globalization, liberalization and privatization, the market has become very demanding, pushing the industry into a situation where there is no excuse for incompetence. It is therefore, necessary to develop manpower to suit this situation. There are two streams in Computer Education. One of them is the Engineering stream leading to the B.E./B.Tech degree and the other one is an application stream leading to the MCA degree. In MCA Stream, the major thrust is on giving the students a sound background in computing, business functioning and mathematics relevant to information technology. Any graduate having mathematics background in 12th standard is eligible to take admission for MCA through admission process defined by the competent admission authority. Currently in Maharashtra, 141 institutes are offering MCA program with an intake of 10875 students out of which 58 institutes are affiliated to University of Pune alone with an intake of 5085 students. The paper gives possible factors that can improve the quality of education as well as Key Performance Indicators (KPI) for their continuous evaluation. India currently has the lion's share in outsourced offshore software development. As a result, the demand for skilled IT professionals is increasing in India. In order to meet the demand, new academic institutes are being established and the existing ones are increasing their intake in IT-related courses. However, according to the latest report of the National Association of Software and Service Companies (NASSCOM) in India, only small percentage of the fresh graduates is considered

readily employable by the IT industry. It is always a challenge for an institute to improve quality of the education imparted to the students. The paper proposes factors that can improve the quality as well as monitoring mechanism for continuous evaluation which leads ultimately towards career development of MCA students.

INTRODUCTION

The beginning of formal Technical Education in India can be dated back to the mid 19th century. The major policy initiatives in the pre-independence period included appointment of the Indian Universities Commission in 1902, issue of the Indian Education policy resolution in 1904 and the Governor General's policy statement of 1913 stressing the importance of Technical Education, the establishment of IISc. Bangalore, Institution for Sugar, Textile and Leather Technology in Kanpur, N.C.E. in Bengal in 1905 and Industrial schools in several provinces.

The growth of industries in the Country, just after independence, also demanded the need for qualified professionals in other fields, such as Business Management, Architecture, Hotel Management, Pharmacy etc. Although the diverse elements of Management such as Commerce, Economics, Finance, Psychology and Industrial Sociology were being taught for a long time, the need for Management Education in a formal way was felt in India only in the fifties. The Government of India decided in 1954 to set up a Board of Management Studies under AICTE to formulate standards and promote Management Education. Other major initiatives taken in Management Education include: setting up of the Administrative Staff College of India at Hyderabad in the late fifties, National Productivity Council and Indian Institution of Management in the early sixties. Architecture was covered under the Architect's Act, 1972. Subsequently, for better coordination of the Professional Courses, Architecture Education was also placed under the purview of AICTE.

Meanwhile, expansion of Institutions and intake remained at a low level in the Government, Private-aided and University sectors. The policy shift during eighties towards involvement of Private and Voluntary Organizations in the setting up of Technical and Management Institutions on self-financing basis ushered in an era of unprecedented expansion of the Technical Education System, a trend which has continued during successive Five Year Plans.

The growth of Technical Education before independence in the Country has been very slow. The number of Engineering Colleges and Polytechnics (including Pharmacy and Architecture

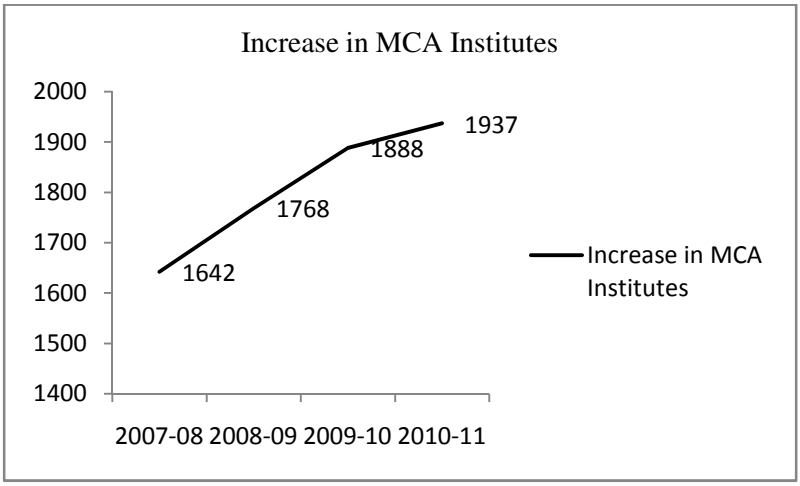
Institutions) in 1947 was 44 and 43 respectively with an intake capacity of 3200 and 3400 respectively.

Due to efforts and initiatives taken during successive Five Year Plans and particularly due to policy changes in the eighties to allow participation of Private and Voluntary Organizations in the setting up of Technical Institutions on self-financing basis, the growth of Technical Education has been phenomenal.

The National Policy on Education (NPE), 1986, as updated in 1992, envisages improvement and expansion of education in all sectors, elimination of disparities in access and laying greater stress on improvement in the quality and relevance of education at all levels, including technical and professional education.

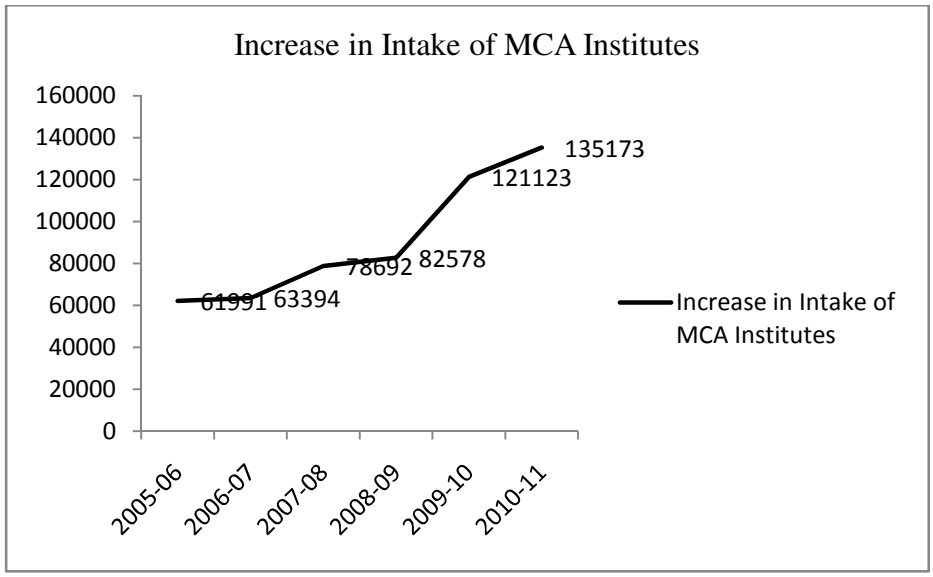
Growth of different Programs in Technical Institutions

Year	Engg.	Mgmt.	MCA	Phar.	Arch.	HMCT	Total	Added in Year
2007-08	1668	2062	1642	854	116	81	6423	417
2008-09	2388	2734	1768	1021	116	87	8114	1691
2009-10	2942	3482	1888	1054	106	93	9565	1451
2010-11	3241	3858	1937	1102	125	101	10364	799



Growth of Seats in different Programs in Technical Institutions

Year	Engg.	Mgmt.	MCA	Phar.	Arch.	HMCT	Total	Added in Year
2005-06	499697	122663	61991	32708	4379	4435	725873	40691
2006-07	550986	144372	63394	39517	4543	4242	807054	81181
2007-08	653290	185780	78692	52334	4543	5275	979914	182860
2008-09	841018	227989	82578	64211	4543	5794	1226133	246219
2009-10	1071896	273732	121123	72836	4133	6387	1550107	323974
2010-11	1324246	378907	135173	103867	4933	7061	1954482	404375



The increased requirement of manpower in the area of computer applications was mainly felt in nineties. The available manpower from engineering programs was insufficient and a Master of Computer Applications (MCA) was a new program initiated by Indian Society for Technical Education in 1990, was taken up by All India Council for Technical Education which proposed a curriculum for a Master of Computer Applications program. MCA is a three year (six semesters) program. The students entering MCA must have BCA / B.Sc./ B.Com./ B.A. degree with Mathematics as one of the subjects at 10 + 2 level or at Graduation. This program became popular and a large number of self financed institutions introduced this program. Currently in Maharashtra alone, 141 institutes offer this program with an intake of 10,875 students. Out of these institutions 58 institutes are affiliated to the University of Pune alone with an intake of 5,085 students and all of them are self financed institutions.

Reference: DTE, Mumbai MAH-MCA-CET 2012

Sr. No	Name of University	Status of University					Total
		Govt.	Govt. Aided	Univ. Managed.	Univ. Dept.	Un-aided	
1.	SNDT University , Mumbai			60(1)		60(1)	120(2)
2.	Mumbai University		60(1)			1380(18)	1440(19)
3	**Pune University**					**5085(58)**	**5085(58)**
4	North Maharashtra University, Jalgaon				60(1)	240(4)	300(5)
5	Dr. Babasaheb Ambedkar Marathwada University, Aurangabad	60(1)			120(2)	480(7)	660(10)
6	Swami Ramanand Teerth Marathwada University , Nanded				60(1)	330(5)	390(6)
7	Shivaji University, Kolhapur	30(1)				540(7)	570(8)
8	Sant Gadagebaba Amarawati University				60(1)	540(8)	600(9)
9	Rashtrasant Tukadoji Maharaj Nagpur University				30(1)	1140(19)	1170(20)
10	Solapur University					540(4)	540(4)
	Total Intake (Institutes)	90 (2)	60 (1)	60 (1)	330 (6)	**10335 (131)**	10875 (141)

THE CHALLENGE AHEAD:

Although, a large number of students enter into this program, National Association of Software and Service Companies (NASSCOM) in India, feels that a small percentage of them are readily employable. One of the major problems faced by most of the colleges offering MCA program is lack of qualified faculty. It is a challenge to the Management of such institutions to improve the quality of education imparted to the students to ensure employability, which is a major attraction for all the candidates joining these programs. It has become, therefore, imperative for the Management of these institutions to look into various aspects leading to the employability of the students passing out from the institutes.

INVESTIGATION:

The following could be major issues which will have to be addressed proposed by the authors.

1. What are the expectations of the recruiters of such fresh passing out students?
2. What are recruiters looking for in terms of knowledge and skills?
3. How to inculcate these qualities in majority of the students?
4. Whether it is possible to establish a quality system to administer and ensure the output?
5. Is it possible to develop a continuous monitoring and evaluation system from the Management perspective?
6. What could be the essential and desirable Key Performance Indicators(KPI) which must be monitored?
7. How to ensure the system to function with the existing faculty available to the institutions?

METHODOLOGY:

1. Employability of the candidates may depend upon a number of parameters. One of the major parameter would be whether there exists the manpower requirement. A research will have to be carried out, especially for MCA candidates to know which industry would generally recruit them. What are the different sectors which would be interested in recruiting such or similar manpower? It is quite likely that many IT enabled services organizations may not be aware that such a program is available with large number of job seeking graduates.
2. It is also likely that the candidate who is offered a job by any recruiter may not be of his / her liking and / or of choice.
3. Research will have to be carried out to identify the qualities / skills that the candidates must possess from recruiter's point of view.
4. Assuming that the curriculum made available for such a program is adequate from recruiter's point of view, then, it would be essential to find out whether majority of the candidates have absorbed the inputs given to them. The teaching-learning process would, then, play a major role and must be scrutinized for its effectiveness. Most of the efforts will have to be concentrated to develop a system for ensuring this effectiveness and the managements would be keen to evolve a methodology to keep track of the effectiveness. Various parameters are associated with the efficiency of this process. Several qualities of a teacher could be identified which would be essential for this effectiveness. Actual class room teaching and making it interactive to improve the understanding of the students is essential for the effectiveness. Continuous assessment of the

students would also lead to such effectiveness. A careful research can establish a proper methodology for this and a Management information system could be developed for keeping a track of this.

5. For all professional programs, including MCA, exposure to the industry is essential. It would be interesting to conduct a survey to find out whether industry assumes a responsibility in participating in such activities. It would be also necessary to find out the gap between current technologies available with the recruiters and those in the curriculum. A research could be carried out to bridge this gap effectively and Managements of such institutions could be advised to take steps to overcome this gap.

CONCLUSION:

The authors plan to take up this issue for their research. The research would involve a survey with recruiters, a survey with faculty, current students and alumni which would result into a systematic procedure not only for effective teaching-learning process but also for providing proper inputs to improve the employability of the fresh candidates completing such a professional program. The outcome of the research would be a guide for the administrators and a monitoring system for the Management of the institutions.

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Annexure 4

District wise Vacancy position in UG Engineering - 2012-13

		Mechanical			E&TC			Computer			Civil		
Sr.No.	**District**	**Intake**	**Admitted**	**Vacancy**	**Intake**	**Admitted**	**Vacancy**	**Intake**	**Admitted**	**Vacancy**	**Intake**	**Admitted**	**Vacancy**
1	Aurangabad	1560	1139	421	1380	812	568	1380	589	791	1020	589	431
2	Jalna	120	90	30	60	23	37	120	27	93	60	12	48
3	Nashik	1920	1700	220	1410	724	686	1770	978	792	1080	773	307
4	Jalgaon	960	762	198	1020	446	574	1110	479	631	510	304	206
5	Ahemadnagar	1260	979	281	1140	530	610	1110	627	483	840	497	343
6	Nandurbar	120	87	33	120	62	58	120	60	60	120	72	48
7	Dhule	480	337	143	600	342	258	540	297	243	270	194	76
8	Buldhana	660	598	62	540	365	175	630	367	263	180	68	112
9	Akola	120	75	45	120	4	116	120	114	6	120	67	53
10	Washim	120	28	92	120	4	116	128	28	100	120	28	92
11	Amravati	780	711	69	1020	908	112	1440	1180	260	420	438	-18
12	Yavatmal	510	328	182	390	383	7	510	451	59	180	185	-5
13	Vardha	720	534	186	900	431	469	810	358	452	360	130	230
14	Nagpur	3480	3010	470	5055	3814	1241	4815	3248	1567	1680	1460	220
15	Bhandara	120	122	-2	180	183	-3	240	221	19	120	123	-3
16	Gondiya	90	90	0	240	240	0	90	89	1	60	60	0
17	Chandrapur	300	278	22	270	214	56	310	239	71	240	191	49
18	Gadchiroli	60	22	38	60	4	56	60	14	46	60	57	3
19	Parbhani	120	44	76	60	17	43	60	19	41	60	13	47
20	Hingoli	120	16	104	120	12	108	60	7	53	60	4	56

21	Beed	180	143	37	210	127	83	270	190	80	180	130	50
22	Nanded	240	217	23	360	320	40	420	404	16	160	134	26
23	Osmanabad	420	234	186	420	148	272	330	93	237	180	56	124
24	Latur	360	213	147	360	144	216	300	104	196	300	175	125
25	Pune	9180	8415	765	8370	5750	2620	10600	7856	2744	3840	2854	986
26	Satara	900	629	271	780	394	386	840	196	644	540	234	306
27	Sangli	1140	885	255	900	523	377	750	421	329	720	384	336
28	Solapur	1770	1214	556	1380	663	717	1410	538	872	840	419	421
29	Kolhapur	1560	1361	199	1620	1207	413	1380	864	516	1140	737	403
30	Mumbai	780	826	-46	2880	2870	10	3550	3550	0	270	284	-14
31	Thane	960	974	-14	1800	1680	120	1870	1797	73	540	545	-5
32	Raigad	1800	1791	9	2280	1966	314	2370	2166	204	780	795	-15
33	Ratnagiti	360	332	28	420	294	126	420	235	185	60	60	0
34	Sindhudurg	180	176	4	240	141	99	180	117	63	120	82	38
	Total	**33450**	**28360**	**5090**	**36825**	**25745**	**11080**	**40113**	**27923**	**12190**	**17230**	**12154**	**5076**

Ref: Directorate of Technical Education, Mumbai, "Perspective Plan for Technical Education in Maharashtra State", October 2012