

# Productivity Measurement Of Technical Institute

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**Abstract:** The increasing concern over globalization between other things has made the achievement of lifetime skills vital for all classes of people. Achievement of such skills can be developed from technical education programs in the advance of any nation. Skill gaining provides knowledge and inculcates the approaches that are essential for arrival and progress into an occupation. When skills are developed in any occupation, it will provide and improve the standard of living with the cover beside poverty, thereby behind national development. This paper observes sampling distribution and moving average concept that how technical education can generate the required skills, the significance of skill acquisition, its roles, benefits and sustainability in national development. It also mentions among others that government should look into and improve productivity that can encourage skill achievement for the youths. The solutions are divided the sampling box into few group before stacking up workstation, and use table and some other wood product. Cost reduction for each solution was intended and the solution with highest cost decrease is chosen to increase the productivity of the college.

**Keywords:** National Development, productivity, Occupation, Skill Acquisition, Technical Education

## 1 INTRODUCTION

The impact of technology currently, business organizations are looking for to find ways to maintain and enhance their competitive positions as a result for the increased global competition [1]. This is why Technical education is accepted by productivity organizations in order to control compound processes [2]. Technical education in response to modest pressures can force business organizations to engage in planned actions [3] and underwrite to organizational productivity and overall performance [4] – [5]. The evolution and progression of the digital economy and knowledge of Technical education has forced itself to become the vital component that change recent business situations and used as one of the calculate the issues that improve businesses and workforce productivity. Today, Information Communication Technologies (Technical education) is progressing quickly and studies at an extensive level try to found a better awareness of its effect on productivity. Technical education covers the use of technologies in information production, information processing, and information recovery and information distribution. Technical education have brought a lot of advantages for its users individually and professionally [6]. Technical education has significant possible to promote development and economic growth, as well as to foster invention and improve productivity. The use of Technical education can result in significant gains in working environment, equality, and standards of living [7]. This same idea was shared by [8] as they professed that the improvement of workforce productivity results in an improvement in the economic health and more significantly economic growth, which will result in accomplishing better life standards.[9] Explored professional value of Technical education.

He revealed that "productivity paradox" ascend as a result of using recent Technical education no matter whether it is a developed or developing country. [10] Declared two main reasons to highlight evaluation of the company's productivity instead of using alternative attributes like profitability. First is that productivity of the organization is gained directly by changes in the manufacture process. Second is that impact of Technical education on productivity could be easier than its impact on productivity. This measured as a main reason for conducting current research to consider deeper in this issue, as well as supports the objective of current research to study the effect of Technical education on productivity.[11] Investigated the relationship between the receiving of Technical education and the organizational awareness, which is the ability of a business to adapt quickly in response to changes in its business environment. They tried to find out how the receiving of Technical education contributes to a firm's ability to be an agile competitor, and they concluded that technology usage had the strongest direct impact on organizational quickness.[12] Determined five issues needed to be done in order to say that we have an increase in productivity:

- 1) Reduce time and determination needed to acquire information resources and to communicate with others.
- 2) Efficiently utilize knowledge work routines (methods, procedures, and technology)
- 3) Realize learning curve reductions in effort and minimize relearning time for infrequently employed routines.
- 4) Maximize incentive through work structure.
- 5) Maximize both availability of attention and value from its use through work structure.

## 2 LITERATURE REVIEW

### 1. Definition and Measurement of Research Productivity:

There has been no concrete definition of what research productivity is. Numerous studies were already conducted focused on this topic with various indicators of measurement. William, as cited by Wichian, et.al.[15](2009), noted that research productivity could be defined in terms of research product and research effort, to the extent of which a researcher produces. Most studies measured research productivity by calculating a composite

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indicator derived by summing up the number of finished research reports, number of published research reports, and number of utilized research report. The measurement of research productivity could be different, depending on the weights given to each indicator. Individual research productivity is defined as output divided by career years. Wherein researcher's output is defined as the sum of the scores of all articles written over his or her career (Fabel, Hein & Hofmeister, [14] 2008). In the normal count, the productivity of each author and institution was calculated according to how many times they appeared in the database [13] (Huang & Hsu, 2005). Sax et al. as mentioned by Wician, et. al. (2009) estimated research productivity as an average number of published research report in the last two years. This study use the researcher's role, publications in journals, research fund and the procedure of research as a surrogate for research productivity.

## 2. Research Skills and Competence

Research productivity according to Wichian, et. al. (2009) is affected by the research skills and technique under research competence. This was supported by Brambila, Veloso and Morgan (2007) [17] who found that there are significant differences in research productivity among areas of knowledge, not only in the peak of publications and citations but also in the productivity cycle. Wichian, et. al. also found that research experience and training in research gave better influence on research output utilization that research communication skills and networking and teamwork also affect research productivity. Self-motivation, essential skills and experience are the fundamental drivers that encourage lecturers to do research. If there are no fundamental drivers, even the University provides other supportive factors; the University's efforts will be fruitless (Lertputtarak, 2008). Low research experience and skills which appear to be the cause of low research productivity in local or regional university, as The Noble University studied by Lertputtarak (2008) becomes also an evident problem in the said university. Therefore, it is suggested that factors related to the lecturers' personal improvement as researchers are essential. Nuqui & Cruz [16] (2012) found consistent with some previous studies that researcher's characteristics and research competence are closely associated with research productivity. The effects further suggest that research competence may have more influence than researcher's characteristics on individual productivity. However, according to Kortlik, et. al. (2008), research confidence explains a major proportion of the variance in faculty research productivity.

## 3 METHODS USED FOR PRODUCTIVITY MEASUREMENT

### 1 Sampling Distribution Method:

A sampling distribution is always centered upon a particular statistic (i.e., the mean, standard deviation, etc.). A sampling distribution is a distribution of samples' statistics. This example is an empirical construction of a sampling distribution of the mean. There are special names for the mean and standard deviation of sampling distributions:

- A. mean = expected value
- B. standard deviation = standard error

### C. The Sampling Distribution of the mean

It has 5 important characteristics:

1. Every sample is drawn randomly from pop.
2. N is the same for all samples
3. The number of samples is large
4. The mean is calculated for each sample
5. Sample means are arranged into a freq distribution

### 2 Central Limit Theorem:

It is a law that states: For any population, the sampling distribution of the mean will approach a normal distribution as sample size (N) gets larger. Furthermore, the sampling distribution of the mean will have a mean expected value equal to the  $\mu$  and a standard error equal to standard deviation divided by the square root of N.

### 3 Moving Averages Method:

A moving average method uses a number of most recent historical actual data values to generate a forecast. The moving average for N number of periods in the moving average is calculated as

$$\text{Moving average} = \frac{\sum \text{demand in previous N periods}}{N}$$

N may be 3, 4, 5 or 6 periods for moving average. A "sample moving average method is used to estimate the average of a demand time series and remove the effects of random fluctuations. It is most useful when demand has no pronounced trend or seasonal fluctuations. In this method, if we use N periods moving average the average demand for the N most recent time periods is calculated and used as forecast for the next time period after the demand is known the older demand from the previous average is replaced with most recent demand and the average is recalculated.

## 4 METHODOLOGY USED

### 1 Need of Productivity Investigation for Technical Education Institution:

Productivity in a Technical Education Institute cannot be measured simply in terms of the students get passed successfully (got degree's) and total number of students entering the institution for education. Therefore other factors which are typical of a service organization with student interface must also be considered. The factors like student satisfaction, service delivery, Institute Environment, up dated equipment Laboratories, employee satisfaction, adequacy and quality of infrastructure have to be taken into consideration. Information regarding these parameters, their transformation into suitable indices, calculation of indices for individual constituents and finally the total productivity index has to be defined, calculated and bench marked for further improvement. While talking about productivity of Educational Institute and quality of service rendered, it is difficult to find precisely defined as well as measurable parameters. As such in direct and specially devised indices have to be developed.

### 2 For this one must be understand:

- The nature of the process
- Various inputs to the process and organization

- Various outputs of their quality

A typical Educational Institution especially Technical Education Institute deploys following main inputs for its operation:

- **Man Power:** students, Teaching and Non-Teaching staff
- **Infrastructure:** Includes building, laboratories, Library, Examination Section, and Administration office (Account) section.
- **Materials:** For laboratories, administrative offices, maintenance, class work, library.

The outputs of this factor-based model can be measured in several dimensions described as following.

- Fully passed students.
- Partially passed students.
- Number of students failed during course of study.

Based on the above-mentioned inputs and outputs an input-output model of a Technical Educational Institute (T.E.I) can be devised.

### 3 Source & Type of Data Collection:

Data on inputs, quality, student status (attendance) and number of students attended etc are very often collected at the T.E.I, but very often not easily available. Information on effects for individuals in terms of daily life activities has to be collected by questionnaire. These are the following persons and locations involved in the present research work, from where the required data can be collected.

### 4 Administration Office:

Each college has an administration/Accounts office where relevant information about students is to be recorded. The following information can be collected from this office.

- Average and total number of students admitted per year
- Total number of faculty, both teaching & non-teaching working in a specific department.
- Average and total number of students relieved/transferred per year.
- Total cost or budget equipment/systems maintenance cost, monthly.

### 5 College Staff:

Following type of information can be collected from the college staff about their satisfaction related to various aspects.

- Facility provided by the management
- Students and their lab assistants or Non –Teaching staff behavior
- Salary
- Additional facilities
- Quality of laboratories and equipments
- Quantity and quality of books and other materials provided by management

### 6 Students:

Following factors can be taken into account for the satisfaction of students is concerned.

- Teaching of faculty and their cooperation.

- Services of the college.
- Quality and quantity of books provided.
- Drinking water, sports, classrooms tables, classroom cleanliness & toilets etc.
- Infrastructure of the college.

### 7 Attendance of the students:

From the attendance of the students, following type of information can be collected, Are they satisfied with?

- Teaching taught to the students.
- Behavior of the faculty both teaching & non-teaching
- Updated Technology and Latest techniques in teaching.
- Extra facilities provided to the students like e-library, Internet etc
- Laboratories faculty as per requirements provided to students.
- Communication & guidance system of college.
- Extra education facilities provided to the students

### 8 Academic Section/Examination Section:

Following factors can be taken into account from the Academic Section for the relevant information about students academic record or conducting of exams for making students quality.

- Number of students attending to exams.
- Number of students passed/failed in exams.
- Average number of students failed and attending the backlogs classes
- Attendance particulars of the students.
- Average number of students detained for lack of attendance.

Data of II, III and IV Sources can be collected through a questionnaire. This data is then suitably tabulated as per the requirement for computing various productivity indices.

### 9 Productivity Index of Technical Education Institution:

In order to calculate the productivity of a T.E.I (Productivity Index) one has to into consideration many factors, which directly or indirectly affect its functioning and efficiency. These factors are converted into indices and after assigning appropriate weightage to each factor, then the total productivity index can be calculated. Total productivity index is an integration of various indices, which are identified on the basis of opinion of the experts. The details of the indices are as follows:

- **Efficiency Index**
- **Effectiveness Index**
- **Infrastructure Index**
- **Employee satisfaction Index**
- **Student Satisfaction Index**

## 5 PRODUCTIVITY MEASURES

On the basis of this model, we conducted a study. This model has been applied to determine the productivity of an college XYZ. Data has been collected from various sources, the efficiency & effectiveness indices have been calculated by considering the data provided by institute and all other indices were calculated by considering the opinions of a sample of employees of institute and students of sample

size 24 and 126 respectively. The details of the sample size of feedbacks are shown below table-8. It may be worthwhile to mention the study in no way in conclusive. It may just be treated as basis for more exploratory research on the subject matter Moreover by using different parameters the productivity might be varying significantly.

**Table-1:** Details of students sample size:

S.No.	Year	Total No. of Students	Sample Size of feedback students
1	MECH II-A	49	6
2	II-B	50	6
3	III-A	45	6
4	III-B	40	6
5	IV-A	45	6
6	IV-B	38	6
7	CSE II-A	50	6
8	II-B	55	6
9	III-A	60	6
10	III-B	62	6
11	IV-A	45	6
12	IV-B	40	6
13	ECE II-A	50	6
14	II-B	50	6
15	III-A	52	6
16	III-B	70	6
17	IV-A	71	6
18	IV-B	65	6
19	EEE II	45	6
20	III	70	6
21	IV	55	6
	<b>TOTAL</b>	<b>1107</b>	<b>126</b>

All the sample sizes in each class are not taken randomly instead we have followed some confined rule of collecting feedbacks from top 2 students, average 2 students and below average 2 students of the each class. So that we wont find any sort of partiality discrepancies for the feedbacks.

**Table-2** Details of faculty sample size:

S.No.	Branch	Total No. of Staff	Sample Size of Staff
1	MECHANICAL	27	6
2	ECE	30	6
3	EEE	14	6
4	CSE	24	6
	<b>TOTAL</b>	<b>95</b>	<b>24</b>

Here also the same feed backs are taken as per seniority wise, seniors and junior staff both feedback had made their feedback for maintaining equality in their sample sizes.

**1. Efficiency Index:**

Overall Branch wise results

BRANCH	TOTAL	PASS	FAIL	Percentage %
EEE	211	177	34	83.88
MECH	405	289	126	71.35
ECE	475	372	103	78.31
CSE	443	360	83	81.26
TOTAL	1534	1198	346	78.09

Total Efficiency Index

$$\frac{\text{Total No Of Students Passed out}}{\text{Total No Of Students Admitted}} = 78.09\%$$

**2. Effectiveness Index:**

S.No	Branch	No of students admitted	No of students passed out	No of students pending	Percentage %
1	EEE	65	55	10	84.61
2	ME	120	60	60	50.00
3	ECE	130	90	40	69.23
4	CSE	135	100	35	74.07
	<b>TOTAL</b>	<b>450</b>	<b>305</b>	<b>145</b>	<b>67.77</b>

Effectiveness Index =

$$\frac{\text{Total No Of Students Passed out}}{\text{Total No Of Students Admitted}} * 100 = 67.77\%$$

**3. Infrastructure Index:**

Sample Size Of Students = 126

Sample Size Of Faculty = 24

	Rating Attribute	Excellent (10)	Very Good (08)	Good (06)	Fair (04)	Poor (02)	Percentage %
STUDENTS	Latest technology & updated laboratories	10	40	56	15	05	65.55
	class rooms (with projector & seminar halls)	9	30	40	30	17	57.40
	Updated Library books	20	35	20	30	21	60.47
	Digital Library	10	20	50	20	26	54.92
	Conference halls	30	20	40	6	30	62.22
STAFF	Latest technology & updated laboratories	3	10	10	1	—	72.50
	class rooms (with projector & seminar halls)	8	8	4	4	—	76.66
	Updated Library	2	12	6	3	1	69.16

books							
Digital Library	1	11	4	2	6	57.50	
Conference halls	5	6	5	5	3	64.16	

Total Infrastructure Index (I.I) = 0.6 (I.I<sub>s</sub>) + 0.4 (I.I<sub>i</sub>)

$$= (0.6 * 60.11) + (0.4 * 67.99) = \mathbf{63.25\%}$$

#### 4. Faculty Satisfaction Index:

Rating Attribute	Excellent (10)	Very good (08)	Good (06)	Fair (04)	Poor (02)	Percentage %
Residential facilities	1	3	8	6	6	49.16
Salary & Perks	10	10	4	—	—	85.00
Promotion Systems	7	7	10	—	—	77.50
Welfare facilities	1	9	7	3	4	60.00

Sample size of employees = 24  
 Maximum marks of each attribute = 10  
 Total Employee Satisfaction Index = Average Of All Attributes  
 = 67.91%

#### 5. Student Satisfaction Index:

Rating Attribute	Excellent (10)	Very good (08)	Good (06)	Fair (04)	Poor (02)	%
Professors Teaching	40	50	20	8	8	76.80
Associate & Assistant Professor Teaching	10	40	40	20	16	61.26
Laboratory Facilities	15	55	30	10	16	66.82
Library (Books & E-Library)	10	50	10	36	20	59.04
Staff Encouragement & Guidance	30	15	40	20	21	62.06

Sample size of Students = 126  
 Maximum marks of each attribute = 10  
 Total Student Satisfaction Index = Average Of All Attributes  
 = 5.19%

#### 6. Weightage given to various Indices by the Experts:

Index Expert	E.I	E F I	I.I	E S I	S S I	Total
Director	45	10	20	10	15	100
Administrative Officer	17	15	22	17	19	100
Placement officer	20	20	25	15	20	100
ECE HOD	19	18	22	21	20	100
IT HOD	10	10	25	25	30	100
CSE HOD	10	20	30	10	30	100
H&S HOD	30	10	20	10	30	100
ME HOD	22	18	20	25	15	100
EEE HOD	23	21	22	17	17	100
CIVIL HOD	10	10	20	30	30	100
Average Value	20.6	15.2	22.6	19	22.6	100

#### 7. Values Of various indices:

Type Of Index	Index Value (I)	Weightage (w)	Weighted Value (I*w)
Effectiveness Index	67.77	0.152	10.30
Efficiency Index	78.09	0.206	16.08
Infrastructure Index	63.25	0.226	14.29
Faculty Satisfaction Index	67.91	0.19	12.90
Student Satisfaction index	65.19	0.226	14.73
<b>Total TPI</b>			<b>68.30%</b>

#### 6 CONCLUSION

This paper delivers new indication on the role of TECHNICAL EDUCATION in the public sector. As in companies, education and worker skill are balancing in industry area, with skill adoption compelling both the request for college-educated employees and interior training levels. Indication on the impact of skill and education on public-sector presentation is more sobering, however. It appears that results in 'knowledge-increased infrastructure size, greater use of written directives, and a larger share of non-production personnel-with little or no influence on productivity. The study identifies the various factors affecting the productivity of an technical education institute. By calculating the productivity of an educational institute one can easily get to know exactly, where the institute is lacking, towards which side improvement is needed. In this paper productivity measurement model has been developed by which, for college XYZ the total productivity index was calculated according to the indices. The TPI (total productivity index of an college XYZ is 68.30%.

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