EMPLOYMENT REALM IN TECHNICAL EDUCATION IN KERALA - A STUDY ON THE PROBLEM OF UNEMPLOYMENT AMONG ENGINEERS

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By

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Certificate

This is to certify that the thesis titled **"Employment Realm in Technical Education in Kerala-A Study on the Problem of Unemployment among Engineers"** is a record of bonafide research work carried out by Mr. Shelly M. K. under my supervision and guidance. This is an original piece of research and has not formed the basis for award of any degree, diploma, associateship, fellowship or other similar title of any University or Board and is worth submitting for the award of Doctor of Philosophy under the Faculty of Social Science of Cochin University of Science and Technology. All the relevant corrections and modifications suggested by the audience during the pre-synopsis seminar and recommended by the Doctoral committee have been incorporated in the thesis.

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Declaration

I hereby declare that the dissertation titled "**Employment Realm in Technical Education in Kerala- A Study on the Problem of Unemployment among Engineers**" is a record of the bona fide research work done by me and that it has not previously formed the basis for the award of any degree, associateship, fellowship or any other title of recognition

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Mr. Shelly M. K.

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Chapter 1

INTRODUCTION

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1.1 Background of the Study

Education is the means of acquiring knowledge and developing skills essential for the creation of assets for both the material and spiritual well being of the individual and the society. All nations of the world, therefore, take it as a responsibility to impart education to its people in order to empower the citizens for accomplishing the task of wealth and asset creation for the promotion of economic growth and development. The pertinent task here is to identify the stage of education that essentially guarantees the attainment of this prime objective. Though much significance has been attached to the primary education for human empowerment, it is in itself inadequate for the technical acumen. For accelerating the pace of economic growth, the country needs to focus more on technical oriented education that promotes scientific thinking, because technology and production are directly related. Technical education therefore occupies a significant place in the overall education system of any country for promoting economic growth. It also provides an opportunity to the people for the development of their skills in consonance with the current and emerging demands in the respective fields of knowledge to make them internationally competitive and absolutely fit for any employment in their respective areas of specialization. Such developments in the field of education help in the pursuit of the human resource development and it forms an integral part of human resource management and macro manpower planning. Those countries which fail to develop technical education to its potential level are not only left behind in the process of growth and development but its citizens are deprived of the benefits of true and real development also. Hence, the educational system of a nation should be structured in such a way that there is a perfect dovetailing at various stages, viz. primary education, secondary education, higher education and in particular technical education that is imparted at different levels, beginning from the technical schools to engineering research and development. Among the various stages of technical education, much public attention is received by the technical education imparted at the diploma level and graduate level.

The stage of technical education at these levels of diploma and graduation becomes complex if there is an imbalance between the number of aspirants and the potential capacity of accommodation. Developmental requirements of the state at the same time necessitate the services of highly qualified manpower. As they are also highly remunerated, the demand for acquiring technical education increases. But gradually there was a subtle withdrawal by the state governments from the responsibility of imparting professional education because of their paucity of funds which led to the emergence of the active private participation in the field of education. It was done mainly through the policies in favor of private players where there is no financial commitment and responsibility for the government. This resulted in the disproportionate expansion of the institutional structure in the field of professional and technical education. Such a populist measure coupled with the permission granted to greedy profiteers for free play in the technical education sector led to a degradation of this sector ultimately culminating in a social problem of unemployment of many technically educated youth. The figures of annual manpower profile for the various years show the growing number of unemployed engineers in India in all states. In Kerala only, the number of unemployed engineers doubled as the unemployment among the diploma engineers increased from around 1100 to 2100 during the period 2000 to 2004 and the number of unemployed graduates increased from around 6100 to 11,200 during the same period[1].

1.2 Statement of the Problem

In India the regional economic disparities are widely evident. Some of the states are privileged to have an edge over others in showcasing higher economic growth through higher productivity. But the state of Kerala is known more for its consumerism than productivity. This paradox of development in Kerala has raised many issues about the prospects of the economic growth and its ability in expanding output and employment.

[1] Mathur, A. N. (2008). *India Yearbook 2008.* New Delhi: Institute of Applied Manpower Research.

The growing demand for the expansion of the publicly funded system of education as merit and free goods emphasized on large allocation of funds for promoting education. Compared to the rest of India, Kerala is far ahead in this respect primarily because of the earlier political and social compulsions of the state. The presumption of assured and guaranteed employment in the Middle East and also in other countries increased further the scope of higher education in Kerala, particularly the technical education.

The dearth of technically skilled manpower among the local inhabitants in the majority of this countries provided ample employment opportunities for the Indians. The increase in the quantum of repatriation amount over and above the expectation led to the pursuit of policies favouring large scale expansion of education at all levels initiated by the government till economic reforms were introduced in India. The departure away from the socialist doctrine and its replacement with market oriented philosophy resulted in the disappearance of the conventional wisdom and instead propagated the idea that education is a commodity having a market that is to be governed by the forces of demand and supply. The state of Kerala did not ignore this principle and experimented the concept of self financing in higher education and technical education in the early first decade of the 21st century. Here education is a private non merit good with incidences of cost and expenditure where the beneficiaries are bound to bear the cost. The history of enormous growth of technical education in Kerala in the recent years is obviously an outcome of the penetration of this private self financing colleges in the professional education sector, particularly in the area of engineering education in the state. It is found that in Kerala there were only 25 government engineering colleges and institutions including University departments offering professional engineering degree courses and 48 government polytechnic colleges offering diploma level courses during the late 1990s (till 1999) and the private aided institutions in the respective field during the same period consisted of 3 and 6 respectively. The number of private self financing colleges at both degree level and diploma level during the pre liberalisation period, i.e. prior to the 1990's, offering these courses was absolutely nil. But as in the year 2009, the number of private self financing colleges increased to 66 at the degree level and 3 at the diploma level in the state of Kerala. Subsequently, the intake of the diploma holders increased to more than 11,000 from 3,700 and those of the graduate engineers increased to more than 23,000 from merely 2,000 during the period 2000 to 2008. The large number of outturn of the engineers was due to the undue expansion at the institutional level beyond the natural limit and its growth at a very high rate resulted in the incidence of unemployment among the qualified engineers. But at the same time it is observed that the rate of unemployment among the diploma engineers is falling since the year 2000, whereas the rate of unemployment among the graduate engineers is multiplying at a very high rate. In the year 2008 the unemployment rate among the graduates reached around 30 per cent which is much above the unemployment rate of 25 per cent existing among the diploma holders[2]. Thus the bumping down theory is not in operation in the engineering labour market in true sense considering the fact that there is a growing rate of unemployment among the graduates vis-a-vis the diploma engineers. Similarly the data of the NTMIS (National Technical Manpower Information System) for Kerala in its report Annual Technical Manpower Review for the

[2] Employment Scenario of Technical Manpower Kerala 2000 & 2008 published by the NTMIS. IAMR, New Delhi

various years and some other reports point out the important problems identified in engineering education in Kerala, such as the difference in the absorption rate and also the rate of unemployment across the various branches of study of the engineers, their gender characteristics, the social category of engineers, etc. The low level of income among the large section of the engineers and wide disparity in their income are also observable from the available figures. Besides this, the diversification of employment to areas other than engineering found among the engineers has further complicated the existing problems in the engineering education.

Research Problem

1) The incidence of high rate of unemployment both among the diploma and graduate engineers.
2) The incidence of high growth rate of unemployment among the graduate engineers compared with the growth of unemployment among the diploma holders.
3) The observation of asymmetrical distribution of unemployment among both the diploma and graduate engineers across the characteristics of their branches of study, gender and social category.
4) The presence and absence of bumping down theory in unemployment among the engineers in Kerala.
5) Higher proportion of engineers diverting to other non engineering areas for employment to disguise their likely status of being unemployed.
6) The likely growth of the phenomenon of underemployment among the engineers in Kerala.

1.3 Significance of the Study

There are many studies undertaken to resolve the problem of unemployment in the unorganized sector and the extent to which this problem has affected the socially and economically deprived classes in Kerala. But till now no serious attempt has been made in the direction to identify the real problem and cause of unemployment and underemployment among the qualified engineers in Kerala which are very essential in the present scenario.

The technically qualified persons form the human resource base of the economy with ardent potential capacity to enhance the rate of growth of the economy. In the belief that the employment opportunities for engineers are buoyant due to high employment elasticity in relation to growth, more of the technical persons are trained to meet the prospective demand. Thus the rise in the software industry in India and the growing need of the engineers in this sector would definitely enhance the scope of employment among the engineers. But facts show that this is not fully true in particular for the engineers who are diploma holders because a boom in the software industry has not relatively benefited the middle level engineers working in the capacity as supervisors. This is because of the reason that either the diploma engineers are bumped down due to the availability of excess graduate level engineers or because of the dearth of opportunities in that particular stage of activity in the industry. It is also interesting to observe that some of the incidences of unemployment among the engineers are possibly due to the outbreak of global recession during the period of 2008-09. In the post recession period the extent of the problem of unemployment affecting the degree and diploma level of engineers has widened. An understanding about the employment characteristics, the magnitude of the problem of unemployment existing among the engineers and an enquiry into its cause are very essential for the policy makers to frame policies which are the corrective measures required to free our economy from the undue and unwarranted consequences of educated unemployment, particularly among the technically qualified professionals.The growth of unemployment if not arrested will also adversely affect the prospects of development of the economy because of its multiplier effect.

Taking these factors into consideration, an analytical study on '**Employment Realm in Technical Education in Kerala –A Study on the Problem of Unemployment Among Engineers'** is undertaken to examine the scope of engineering education in Kerala.

The objectives of the study are set in such a way to find the answers for the following research questions:-

1.4 Research Questions

1) What is the magnitude of the unemployment among the engineers in Kerala?

2) What is the extent of the difference in the incidence of unemployment among the diploma and graduate engineers in Kerala?

3) What factors are associated with the nature of employment and problem of unemployment among the engineers in Kerala?

4) Is the bumping down theory really evident and applicable while examining the nature of unemployment among the diploma and graduate engineers in Kerala?

5) Does any prevalence of high magnitude of unemployment among the engineers due to fewer job offers in their area of study force the engineers to divert to other areas for employment?

6) Is the incidence of underemployment really evident among the engineers in Kerala?

The present study has set its objectives to find answers to the above research questions.

1.5 Objectives of the Study

Prime objective

The major objective of the study is to identify the activity status and also analyze the features of employment and unemployment among the newly passed diploma and graduate engineers in Kerala in various disciplines of study.

Sub Objectives

1) To identify the destination of employment, i.e. whether the employed engineers are in engineering or non-engineering areas and also their employment profile.

2) To estimate the level of academic performance of the engineers, the number of engineers pursuing higher studies and also the reason for joining higher studies along with the factors associated with the academic performance of the engineering students.

3) To analyze the association of the academic, demographic and social profile of engineers with the level of their employment, underemployment and unemployment.

4) To identify the factors leading to unemployment among the engineers in Kerala.

1.6 Conceptual Framework

The conceptual framework here includes identifying the work force or the labour force, the employed and unemployed.

The concept of work force: In India there is a continuing debate among economists and planners over the best measures of labour force participation and utilization despite the fact that the Commission of Experts on Unemployment constituted by the Planning Commission under the chairmanship of Prof.M.L.Dantawala[3] has given clear guidelines on the correct measure of aggregate labour force.

As per the existing measures of labour force, there are four different concepts used in India in this regard. These are:

1) Usual Principal Status(UPS)
2) Usual Principal and Subsidiary Status(UPSS)
3) Current Weekly Status(CWS)
4) Current Daily Status(CDS)

A person is classified as belonging to labour force in the usual principal status, if he or she has been either working or looking for work during the longer part of the 365 days preceding the survey.

Thus a person who works intermittently either because of the pattern of work in the household farm or enterprise or due to economic compulsions and other reasons would not be included in the labour force unless their days at work and unemployment totalled over half the reference year.

[3] Planning, Commission. (1970). *Report of the Committee of Experts on Unemployment Estimates.* New Delhi: Planning Commission.

The Usual Principal and Subsidiary Status concept was introduced to widen the UPS concept to include even those who are outside the labour force on the basis of the majority time criterion but had been employed during some part of the year on a usual basis. In the NSS 61st round survey, all those workers who are either unemployed or out of the labour force but had worked for at least 30 days over the reference year were treated as subsidiary status workers. This measure was used because it was a stable and more inclusive measure since the persons working for 30 days or more but not working for the major part of the year were also included.

The concept of current weekly status is the other means of identifying the labour force and it has been in use in the labour force surveys in India even before 1970, when the recommendations of the Dantwala Committee became available. It was primarily because the agencies like International Labour Organization (ILO) use estimates of employment and unemployment rates based on weekly reference period for international comparisons. Under CWS, a person is classified to be in labour force, if he/she has either worked or is seeking and /or is available for work at least for one hour during the reference period of one week preceding the date of survey.

The Current Daily Status measure was proposed by the Dantwala Committee for studying the intensity of work. These are computed on the basis of the information on employment and unemployment recorded for the 14 half days of the reference week. An hour or more but less than four hours is taken as half intensity and four hours or more is taken as full intensity.

The use of any of these measures depends on the nature of study, the type of target group and the intensity of the problem the investigator intends to measure in respect of the unemployed.

The concept of employment, unemployment and underemployment: The concept of unemployment and the degree of employment can vary according to the nature of study. But, only that part of the labour force who are willing to work is considered as the subject matter of study.

The concept of unemployment here must be analysed on the basis of (1) willingness to work (2) employability, and (3) employment. These interpretations, however, do not have any absolute meanings but rather their meanings are tied to the purposes underlying investigation of unemployment [4]

Literally, unemployment can be defined as the status of those able bodied and qualified persons in the labour force who fail to get potential employment or are not engaged in any productive activity both physically and mentally. The labour force comprises both non technical and the technical manpower including large number of professionals; say, engineers (both diploma and graduate) and also persons holding basic technical certificates of AICTE or NCVT in India. But in the present study the labour force consists of only those part of the population among the technically qualified who passed diploma and graduation in engineering in the year 2009 within the given time frame for each course being 3 years for diploma and 4 years for graduate engineers.

Raj Krishna's definition of unemployment is the criterion used in the present study to distinguish between the employed, unemployed and underemployed which is mainly based on the time, income, willingness and productivity[5].

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[4] Clarence, D. L. (1942). The Concept of Unemployment. *Quarterly Journal of Economics*, *57*(1).

[5] Raj, Krishna. (1973). Unemployment in India. *Economic and Political Weekly*, *8*(9), 475-484.

Raj Krishna's four alternative criteria for the definition of the status of unemployment, therefore, includes

1) Working time less than normal standard (the time criterion),
2) Income or consumption less than some normal standard (the income criterion),
3) Willingness to do more work (the willingness criterion); and
4) Productivity less than some normal standard (the productivity criterion)

The present study also aims to estimate the unemployed engineers for a particular time in the state of Kerala on the basis of the outflow of a group of technical manpower in the state during a particular period of time. The estimates of unemployed engineers comprising both the diploma and graduate engineers in various disciplines mean those engineers who fail to find employment after two years since passing their respective courses of study.

To identify the group of the unemployed, it is essential to firstly identify the group of the employed. They are those categories of engineers in Kerala, fully and regularly employed, including the self employed in their respective profession either related or not, earning an income. Thus the rest of the population who are not employed for the majority of the time after passing their respective courses and also remain unemployed at least 30 days from the date of survey are treated as unemployed. The part of the population not declared as qualified, or who are ineligible for higher studies do not form the part of population in estimating the number of the employed and the unemployed.

As stated earlier, the present study also attempts to estimate the underemployed engineers in Kerala among those who passed during 2009. The underemployed in its broader sense refer to those who even if employed, contribute towards output less than their potential level. The employment-unemployment surveys conducted by the National Sample Survey Organisation provide data on wage and salary earnings received or receivable for the particular work and are the base for computing the average earning for any particular category of work. The underemployed here are those who fail to get fixed minimum daily wage.

In the present study the underemployed engineers refer to those who earn an income less than the average income of the engineer's computed among the samples in the respective branch of their study and course of study whichever is less.

1.6.1 Unemployment – its Economic Meaning and Theoretical Framework

The concept of unemployment has been explained in economics from the beginning of the classical doctrines propounded by various classical economists, but it became the major focus of economic thought only after the Great Depression of the 1930s and thereafter the publication of General Theory by Lord J. M. Keynes. The unemployment as a phenomenon of economic events is now being explained by economists from different perspectives. The main school of thoughts of unemployment which forms the basis of framing important theories of unemployment is given below.

1.6.2 Theories of Unemployment

The following theories of unemployment mainly form the base of identifying the employed and unemployed. They are:

- The Classical Theory
- The Keynesian Theory
- The Neo Classical Theory
- The Human Capital Theory
- The Filter Theory
- Bumping Model and Job Ladder Model
- Job Search Theory
- Contract Theory
- Efficiency Wage Theory
- Bargaining Theory
- The Insider Outsider Theory
- General Equilibrium Theory

The important theories used in the present analysis include:

i) **The Keynesian theory:** The Keynesian concept of involuntary unemployment is used to identify the unemployed. Thus the engineers who keep away from the labour market or are not looking for any job are not considered as unemployed.

ii) **Bumping Model and Job Ladder Model**[6]: Fields in 1974 developed the Bumping Model focusing on the influence of unemployment process and Bhagwati and Srinivasan developed the Job Ladder Model

[6] Fields , G. S. (1974). Private Demand for Education in Relation to Labour Market Conditions in Less Developed Countries. *The Economic Journal, 84*, 906-920.

Bhagwati N Jagdish and Srinivasan T N. (1977). Education in a Job Ladder Model and the Fairness-in-Hiring Rule. *Journal of Public Economics, 7*, 1-22.

in 1977. According to this model the employers resort to a policy of preferential hiring during the period of excess supply so that people with higher levels of education are absorbed first. When the number of higher educated individuals exceeds the number of jobs corresponding to their qualifications, they spill over to the next best jobs, bumping out the less educated. Hence those individuals who are on the lowest rung of the ladder of education are prone to chronic unemployment and underemployment.

The job competition model in contrast to the bumping model hypothesizes that supply factors do not have a very significant role in determining jobs and earnings of an individual. Thurrow (1972) believed that earnings are more associated with jobs rather than with the qualification of the individual who fill the jobs. According to this model persons with differential levels of education may earn the same, provided they are in the same job. It is because earnings are determined on the basis of the nature and type of jobs. Thurrow[7] argued that labour skills in their finite form do not exist in the labour market. Aiming at profit maximization, employers are interested in reducing the training cost of their prospective employees. Therefore, the employers prefer those who can be trained easily at cheaper costs. But in a complex market situation, the employers do not have any reliable mechanism to assess the exact training costs of each individual. Hence they depend on the background characteristics in selecting the prospective employees. Education is used as one of the background characteristics and a proxy variable for hiring the prospective employees. The basic

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[7] Thurrow, L. C. (1972). Education and Economic Equality. *The Public Interest*,(Summer), 66-81.

assumption is that the better educated pick up skills rather quickly and, therefore, the training costs will be less[8]. In this sense, labour with higher level of education will be the first to be picked in the labour market.

iii) **Job Search Model**-It is one of the important labour market theories with the assumption of individuals maximizing expected lifetime income and the individuals setting a reservation wage at a level which makes the expected gain from further search just equal to the expected cost. The search model explains the phenomenon of unemployment as a consequence of search and the duration of search depends on factors like the unemployment insurance cost, the mean value of the searcher's wage distribution, the dispersion value of the wages, the searcher's discount rate comparing the present value of the income foregone because of being unemployed and the expected earnings in the future in the post employment conditions.

The job search theory is based on the assumption that job seekers only have access to information about the available job opportunities and that it will take certain time to find a suitable job (Devine and Kiefer,1991)[9]. The job search theory postulates a sequential character of job searches, with the job seeker being offered only one job in any given period of time. Despite being largely ignorant of future job offers, job seekers have to decide whether to accept an offer or to continue looking for work. Notwithstanding the increasing opportunity cost of unemployment in

[8] Alphonsa, M. J. (1994). *Educated Unemployment in Kerala.* Ph.D. Thesis, Cochin University of Science and Technology.

[9] Kiefer, N. M. (1991). *Empirical Labour Economics: The Search Approach (with T. J. Devine).* Oxford University Press.

terms of forgone income, accepting the first offer might not be the optimal strategy- a better offer may arrive in future. In response to this, the unemployed worker determines a reservation wage and accepts the first wage offer that is equal or exceeds it.[10]

The level of reservation wage is determined by a variety of factors including first and foremost the type and level of the occupational qualifications and the other factors are the current demand for these skills, access to other source of income, such as unemployment benefits, social assistance benefits and the income of other household members, and lastly the direct costs of the search for work. Job search theory predicts that both the level of unemployment benefits and the duration of its receipt will be related to the level of reservation wage. Those entitled to unemployment benefits set themselves a higher reservation wage than non-recipients. Accordingly their job acceptance rates tend to be lower while receiving unemployment benefits. Thus the receipt of unemployment benefits lengthens the average unemployment spell (Meyer, 1990)[11]. Once unemployment insurance has been exhausted, recipients drop the level of their reservation wage to that of non recipients.

Assuming heterogeneity among the job seekers, it is found that the expected wage distribution pattern is different for each job seeker and the search cost for each of the job seekers is also different in the model. Thus

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[10] Matthias Pollmann-Schult, Felix Buchel. (2011). *Unemployment Benefits, Unemployment Duration and Subsequent Job Quality: Evidence from West Germany*. Luxembourg: Sage Publications Ltd.

[11] Meyer, B. D. (1990, July). Unemployment Insurance and Unemployment Spells. *Econometrica, 58*(4), 757-82.

it fails to explain the uniform price of the factor essential to eliminate search induced unemployment[12].

The search model as an explanation of the cause of unemployment is essentially a supply-side model and it fails to explain the demand perspective of being unemployed. The search theory explains the process by which the wages are discovered and how labour supply responds to these wages.

1.7 Operational Definitions

Employment Realm

The various aspects of employment among the engineers across a wide range including the kind of work performed by the engineers, their activity, functions, sector of employment, etc. indicate the employment realm in engineering.

Technical Education

It is an education of that type which aims to develop skills that make an individual capable of handling machines and other artificial equipment, assisting and supplementing the existing labour power for the generation of a higher level of output and thereby expand the scale of production. The technical education in the present context takes only those courses that offer a degree or diploma certificate in engineering imparted through the graduate engineering colleges and polytechnic colleges in the state of Kerala.

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[12] Peter Fallon, Donald Verry, P.Allan (1988). *The Economics of Labour Markets.* Oxford and New Jersey: Business and Economics.

Kerala

The political boundary of Kerala consists of the areas that are within the domain of the concept of 'State'as given in the Indian constitution for rules under the federal structure comprising fourteen districts extending from Thiruvananthapuram in the south to Kasargod in the north.

Technical Unemployment or Unemployed Engineers

That part of the labour force acquiring the technical qualification of a degree or diploma in engineering and who are ready to render their services for productive activities, but fail to find any employment for earning an income constitute the technically unemployed labour force. Thus the unemployed engineers are unemployed during the majority of time after passing their course of study till the date of survey.

1.8 Methodology

Since the approach to the present study is focused on estimating the various dimensions of employment and also on the level of unemployment among the engineers in Kerala that consist of both the diploma and graduate engineers, the survey method is primarily adopted to collect necessary data. The population of the data is scattered over a large geographical area. Assuming that the good analytical use of the data is essential to substantiate the findings, an attempt is made to collect adequate data that minimizes both sampling and non sampling errors.

1.8.1 Data

For the present study the researcher has used both primary data and secondary data. Since the study aims to estimate the rate of unemployment of engineers across the state of Kerala and as it could not be met from secondary sources alone, the primary data was also collected by means of a mailed questionnaire and telephonic interview.

The secondary sources consist of various publications of the NTMIS in their Annual Technical Manpower Review Kerala over many years and "The Manpower Profile" published by the Institute of Applied Manpower Research, New Delhi and "The Employment and Unemployment Situation in India NSS 64^{th} and 68^{th} Round published by the National Sample Survey Organisation, Govt. of India, Reports, journals and other publications, etc.

The Annual Technical Manpower Review publishes annually the various sets of data collected from the institutions and other sources regarding the employment profile and other aspects of employment of fresh engineers and they have been a good source of information about the extent and level of employment and unemployment among them both at the degree and diploma level. Yet there is much unfilled information that is inadequate to extract true inferences about the population of engineers in Kerala.

Hence to fill these inadequacies, primary data is collected through questionnaires and schedules from the fresh engineers in Kerala. The primary data was collected from those engineers who passed during the year 2009 and have completed their course within the given time frame. The sample survey spread across all the 14 districts in Kerala and in all branches of specialization. The questionnaire was administered during September 2011 to March 2012 through mail. Experts in this field have also been approached to know more about the problem of unemployment and underemployment of engineers and their employment profile at present and its prospects in the future. The views of the experts have also been incorporated to derive the conclusions. The opinion of the placement officer in the institutions, the Supervisory Development Centre, Govt. of Kerala and the manpower consultants were also gathered through unstructured oral interviews about the opportunities and scope of employment among the new engineers.

1.8.2 Sample Design

The study employed stratified random sampling technique. The universe of the study constitutes the total passed engineers in Kerala during the year 2009 in their respective courses, both of graduate engineers and diploma engineers. The passed engineers from various institutions in the state in different disciplines among the graduates admitted during the academic year 2004-05 and those during 2005-06 among the diploma engineers only form part of the population. The address of the candidates was obtained from the NODAL centre, CUSAT, Kerala and the sample was selected in such a way that it covered all the fourteen districts of Kerala. The concentration of these institutions in any region is insignificant at this stage and hence all the regions are covered while drawing samples from the population. However the total population is divided into three prime regions, namely, the south consisting of the districts of Thiruvananthapuram, Kollam, Pathanamthitta and Allapuzha, the central region consisting of, Kottayam, Idukki, Ernakulam, Thrissur and Palakkad and the northern region consisting of the districts of Malappuram, Kozhikode, Kannur, Wayanad and Kasargod.

From the preliminary observations it is understood that there is no substantial difference in dispersion of population across regions. The sample was, therefore, selected from all the regions with no proportionate weightage on the basis of the region. This was because the engineering course comprises various disciplines which are not equally and evenly spread in all the districts and regions. Thus the samples are selected in such a way that the period of study of fresh engineers who passed in various disciplines in engineering for the year 2009 are taken as the reference period for considering the weightage of samples in each discipline.

The samples from each branch consist of approximately ten per cent of the total passed students during 2009 in each course. After the choice of disciplines, the institutions offering these courses across the state of Kerala are identified. The samples are chosen in such a way that all the institutions are covered irrespective of the type of management. Since adequate and accurate information about the number of passed students in all the institutions is not known, proportionate institutional weightage to precise level could not be maintained at this stage of investigation.But care is taken to include all types of management of the institutions while choosing the samples, i.e. samples are selected from the government institutions, private aided institutions and unaided or self financing institutions. The technical education in the state of Kerala comprising the diploma institutions and engineering colleges is spread across all the 14 districts in Kerala. The diploma institutions brought under the ambit of study consisted of 58 colleges in 27 disciplines and the number of engineering colleges offering graduate level degree consisted of 94 colleges offering degree in 26 disciplines comprising the government run institutions, private aided colleges and private unaided colleges.

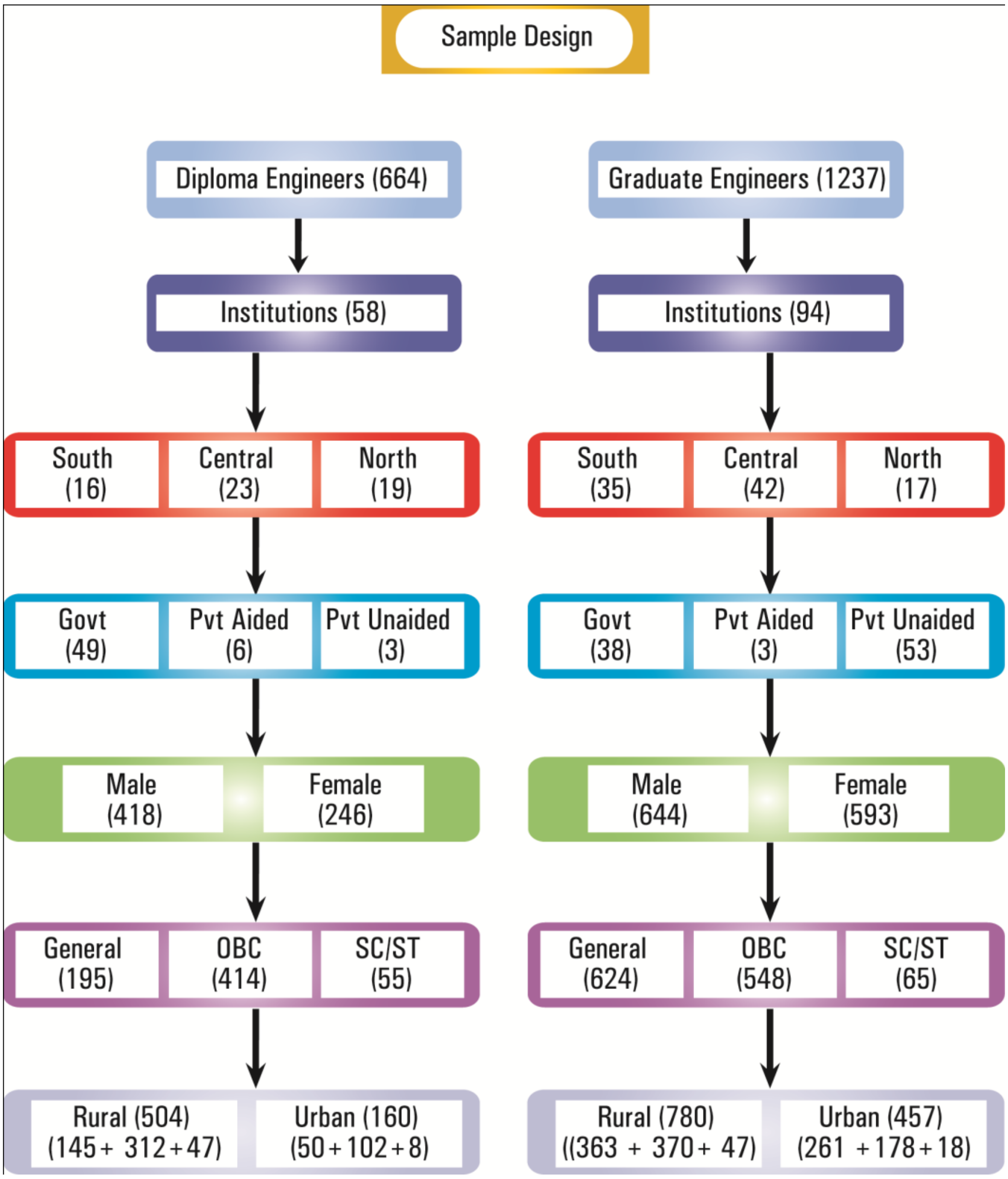

Figure 1.1 Schematic Representation of the Samples

The samples also consist of both the rural and urban population, male and female and also are drawn from the various social groups

The information obtained shows that 5702 number of diploma engineers and 10991 number of graduate engineers passed in the year 2009[13]. The details of the students passed in each branch is given in Appendix 1 Table 1.1 and 1.2.

1.8.3 Tool Design

The questionnaire was mainly chosen as the tool for collecting information from the students. The telephonic interview was also done to confirm the received information in some cases and also to gather adequate number of responses. The unstructured interview schedule was chosen for gathering information from the academics and experts about the role of placement facilities in providing guidance on employment opportunities for students and other means through which the employment scope of engineers could be enhanced. The views of the experts and specialists in the field were incorporated to explain the features of employment and unemployment among the engineers to make the study more authentic. Necessary changes were made in every stage of the study.

1.8.4 Pretest

The designed questionnaire was administered to 50 individuals of the different target groups. The data was analysed and verified. Necessary modifications were made in consultation with experts in this area and the final tools were prepared for the collection of data.

[13] Data compiled by the investigator from the information obtained from engineering colleges appeared for examination in the year 2009 as regular students obtained at the NODAL centre, Kerala.

1.8.5 Collection of Data

The collection of data from the primary source i.e. from the students, started during the month of September 2011 and was completed by September 2012 using the mailed questionnaire and telephonic interview after many reminders to obtain the adequate number of samples. Initially 1,000 number of questionnaire was send to the diploma engineers and 2,000 numbers belonging to the graduate engineers. The number of responded questionnaire for diploma and degree was 757 and 1620 respectively. Among them, the incomplete and inadequate information that is essentially required for the survey but does not figure in the questionnaire is rejected. The final sample thus consisted of 664 diploma engineers and 1237 graduate engineers. The final samples are selected in such a way that their representation is on the basis of the number of passed engineers in each branch of study in their respective courses during the year 2009.

1.8.6 Method of Analysis

The primary data that are gathered from the students and the institutions are subjected to statistical analysis using tools, such as descriptive and causal analysis of absolute and relative figures, mean, standard deviation, and inferential analysis of the estimated values through Chi-Square, Kruskal Wallis test. The other statistical analysis includes ANOVA test, multinomial logistic regression and canonical discriminant analysis.

The secondary data collected from the various reports of Technical Manpower Review and NTMIS bulletin for the state over the years was subjected to independent 't' test and trend analysis for estimating the trend of unemployment among both the diploma and graduate engineers mainly across the branches of study.

1.9 Scope and Coverage of the Study

The present methodology adopted in the study is to showcase the prospects of employment for the fresh engineers and the problem of unemployment encountered by the passed engineers. It also aims to highlight the constraints faced by the passed engineers in finding good employment so as to make a wise decision before stepping into a professional course. This will help the upcoming engineers in the selection of the right branch of study, in the right type of institution of study in a particular course and also help them to make appropriate decisions in the choice of the course of study. Since the study covers all the regions where the engineers are spread, it is comprehensive in approach with less scope of error committed due to bias in the choice of the samples of the study.

1.10 Scheme of the Study

The study has seven chapters. Chapter one, the introductory chapter, deals with the statement of the problem, objectives of the study, the conceptual and theoretical framework, methodology, scope and coverage of the study.

Chapter two 'Education System in India with Special Reference to Engineering Education in India and Kerala', deals with educational system in India with the thrust on higher educational enrolment in India, particularly in states including Kerala, apart from Technical Education: its evolution and growth, engineering education in economic planning, its present stature, scope and importance in Kerala perspective.

In chapter three, ‘Activity Status of Fresh Engineers in Kerala: Issues and Challenges’, the major areas of discussion are an overview of the activity status of the present diploma and graduate engineers: their branch analysis, regional differences, the gender perspective, the social characteristics and their institutional and geographical background.

The Chapter Four is ‘Employment Profile of the Diploma and Graduate Engineers in Kerala: Problems and Prospects’. Here the area of employment and diversification of the engineers to other areas on the basis of the branch of their study, gender characteristics, and their social category are examined. This chapter also discusses the various aspects of employment in the post employment stage, such as the sector of employment of engineers, the functions rendered by these engineers on employment, the various means of getting employment, the job satisfaction attained, the level of monthly income received, the income satisfaction attained from job across the various branches of study, their gender characteristics, the social category of the engineers, the type of institution of study, their area of residence, the level of parental education, etc.

Chapter Five deals with the academic achievement of the engineers both among the diploma and graduate engineers and the number of students opting for higher studies which is either to disguise their state of unemployment or due to the other factors that prompted the engineers to choose higher studies also based on their various characteristics such as the branch of their study, their gender and social profile, the type of the institution of study, their level of parental education, their area of residence, etc.

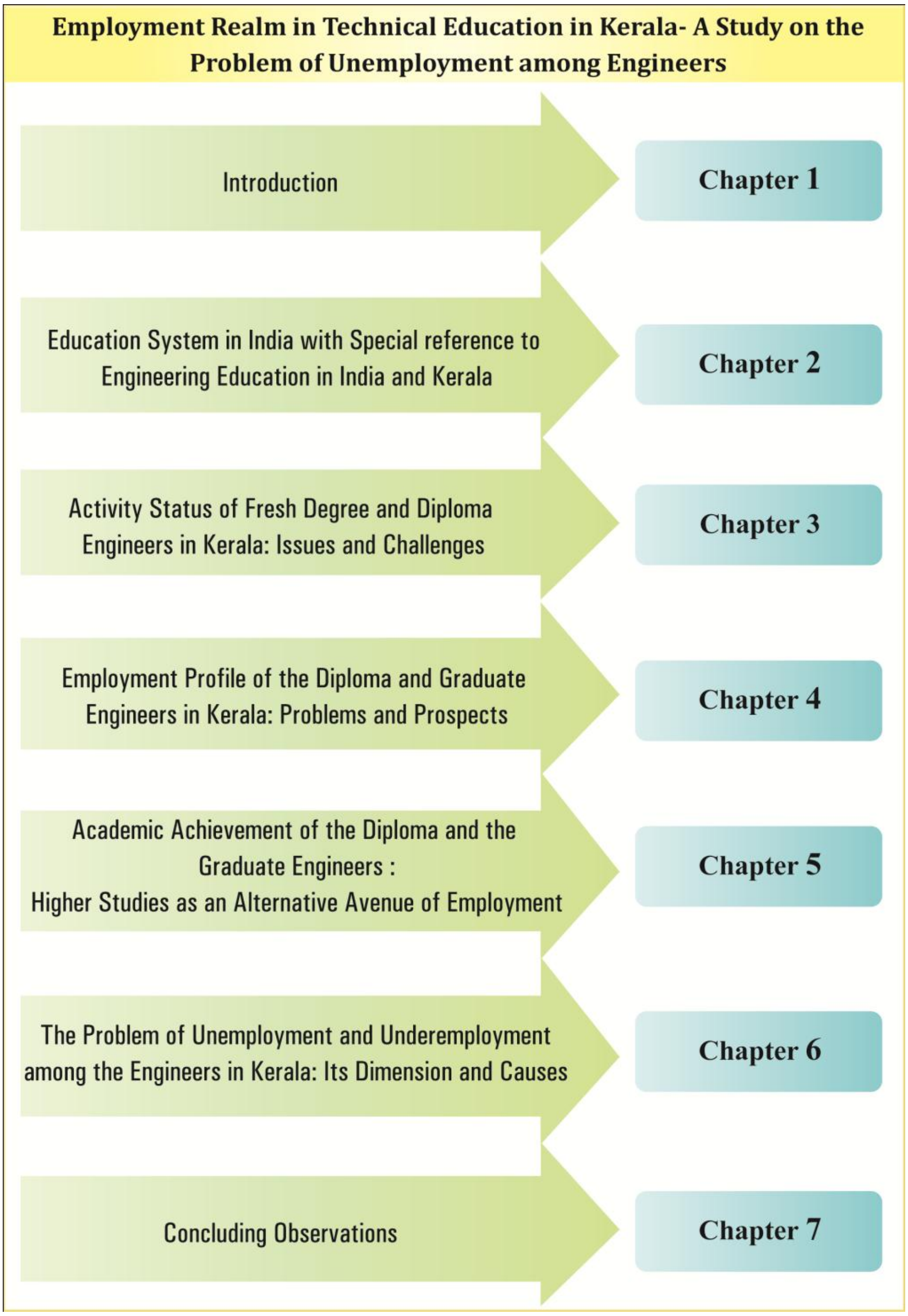

Figure 1.2 Scheme of the Study

Chapter Six discusses the problem of unemployment and underemployment among the diploma and graduate engineers, the cause of unemployment and its dimension across the various branches of study, their gender characteristics, the social category, the type of the institution of study, the area of residence, etc.

The last Chapter (Chapter seven) sums up the observations.

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Chapter **2**

EDUCATION SYSTEM IN INDIA WITH SPECIAL REFERENCE TO ENGINEERING EDUCATION IN INDIA AND KERALA

Contents

2.1 Introduction

Education aims to enlighten and dispel the darkness in the world of thoughts of human beings. It is a means of reaching pure knowledge from ignorance. But in modern times, education has other objectives also. It makes a person knowledgeable and also brings an insight in their life that can be productively utilized for the material as well as spiritual development of his own self and the society at large. All countries aim at this objective of educating its citizen in such a way that all the citizens and the state gain mutually by transfer of respective resources material and otherwise. The curriculum is framed in such a way at each stage to accomplish this ground along with the egalitarian objectives. Policies are therefore framed at macro level to sketch the correct road map for achieving the above said wider objectives of education.

The curriculum for the primary, secondary, senior secondary and higher education comprising technical and non- technical sectors is therefore set in such a way that the students after completing their education at a particular stage will be fit to render output equal to what is expected from that particular stage of education. As the economy grows over a period of time, the production techniques transform in favour of capital intensive production and hence the prevailing education systems should therefore, necessarily adapt and focus on technical education to meet the requirements in future. In modern society the scope of technical education widens as the economy reaches higher epitomes of growth.

As there are no international guidelines on education, each country is free to set its own priorities in education. Some focus on technical education and others on general education. If a country fails in framing its education policies to address the requirements of its own economy, there will arise scarcity of labour in some areas while abundance exists in others. Similarly a situation crops up where some categories of labour are overpaid and others underpaid because of the incidence of their high rate of unemployment. This difference further widens across regions, if the regional educational policies dominate over the national educational policies. The problem is more relevant in India because as education is in the concurrent list both the state government and the union government independently frame education policies suitable to meet the interests of the party in governance. Therefore, we observe an uneven spatial distribution of labour across various categories in their skill across the states in India. The concentration of the professional institutions particularly the technical institutions in the south and western part of India is a testimony to the fact that skill distribution is uneven in India.

Table 2.1 Number of Technical Institutions and Intake Approved for the year 2006-07

Region	Number of Institutions	Sanctioned Intake	Average Intake per Institute
Central	142	49276	48
Eastern	120	35852	299
North	129	46013	357
North-West	172	59167	344
South	553	215188	389
South-West	221	85707	387
West	174	59783	344
Total	1511	550986	365

Source: Data compiled from AICTE: Handbook

In the post economic reform period there has been a notable spurt in the economic growth in India. The increase in the skill based activities contributed much to the growth in the economy. Such activities depend on the large pool of qualified manpower that is fed by its large higher education system. It is now widely accepted that higher education has been critical to India's emergence in the global economy[1]. But the higher education system in India is not fully equipped to accept global challenges. A comparison with the facts observed in the rest of the world demonstrates that higher education system in

[1] Agarwal, P. (2009). *Indian Higher Education: Envisioning the Future.* New Delhi: Sage Publication. New Delhi

India is relatively effective in imparting specific skills through its education system and there are many flaws which are still to be overcome.

A comparison of the higher education system and policies followed in some of the select countries of the world is enough to evaluate the position of India in this regard. For instance, the United States of America made heavy doses of investment in the higher education system in order to maintain its legacy at the level of higher education. The United States despite having the finest system of education set up a commission to examine the future of higher education in September 2005 with a mandate to ensure that America remains the world's leader in higher education and innovation. In the United Kingdom the state has injected new dynamism in the higher education sector through competition and incentives. The higher education system in the United Kingdom introduced innovative measures of financing such as performance based funding for teaching, research and portable students' aid to improve the quality of higher education. Similarly China has undertaken a package of comprehensive reforms in higher education over the past two decades and declared education, science and technology to be the strategic driving force of sustainable economic growth[2]. Higher education reforms in China were initiated as a result of the transformation of the economy to a market oriented one through the initiation of the economic reforms in the year 1978. The concept of cost sharing and cost recovery was introduced in the early years of reforms and tuition fees have now been made compulsory. The higher education institutions in China were expected to diversify their revenue sources, and, therefore, allowed to have affiliated enterprises (Sanyal and

[2] Agarwal. Op.cit.p.25

Martin, 2006)[3]. Thus through a national legislation in 2002, China proactively involved the private sector to contribute and invest in higher education. In Australia, comprehensive reforms were initiated in the year 2003 when government funding was significantly enhanced along with increased provision for subsidized loans and scholarships for students. In neighbouring Pakistan the University Grants Commission was replaced by a proactive Higher Education Commission that initiated wide- ranging systemic reforms in 2002 on the recommendation of the Task Force for Improvement of Higher Education.

2.2 Education System in Modern India

The present educational system of India is the product of British rule. The Wood's Dispatch of 1854 laid the foundation of present system of education in India. With the introduction of Wood's Dispatch known as the Magna Carta of Indian education, the responsibility of imparting education rested with the government. Under it the medium of instruction at school level educations was the vernacular languages while for higher education it was through English only. British government started giving funds to indigenous schools in need of help and thus slowly some of the schools became government-aided.

The educational reforms in India that brought radical changes in the educational system was merely the outcome of many commissions constituted in the pre-independence and post independence period. Some of them focused on the problem of general education where as others on higher education. For

[3] Sanyal, C.B. and Martin, M. (2006). Financing Higher Education: International Perspectives. In G. s.-1. Universities (Ed.). Palgrave Macmillan.

instance on the basis of the report of the Sadler Commission (1917-19), also referred to as the Calcutta University Commission, the Central Advisory Board of Education (CABE) was set up to define the general aims of educational policy and coordinate the work of various provinces and universities by guarding against needless duplication and overlapping in the provision of the more costly forms of education. The University Education Commission of Dr. S. Radhakrishnan, in its report in 1949 recommended that university education should be placed in the concurrent list so that there is a national guarantee of minimum standards of university education. The Kothari Commission (1964-66) examined various aspects of education at all levels and gave a very comprehensive report which was later transformed into the National Policy on Education, 1968. Besides inducting a common scheme of studies for boys and girls and incorporating science and mathematics as compulsory subject at school level, a beginning was also made in the restructuring of courses at undergraduate level[4].

In order to tackle the problem of access, quality, quantity, utility and financial outlay, accumulated over the years, the National Policy on Education (NPE) was put in place in the year 1986. It accepted the fact that education is a unique investment for the present and for the future. The NPE was supplemented with a Programme of Action (POA) in 1992. But with the economic reforms of the 1990’s; the private sector has assumed a prominent and larger role in the economic development of the nation. The educational policies framed should necessarily satisfy the need of this sector too. Hence a holistic review of the instruments currently available for managing the higher education system such as the University Grants Commission Act, the All India Council of Technical

[4] Ibid;pp :xxx

Education Act, and their working style in the present context is essential and necessary.

Education system in India presently can be divided into many stages.

Pre- Primary - It consists of children of 3-5 years of age studying in nursery, lower kindergarten and upper kindergarten. At this stage student is given knowledge about school life and is taught to read and write some basic words.

Primary - It includes the children of the age group of 6-11 years studying in classes from first to fifth.

Middle - It consists of children studying in classes from sixth to eighth.

Secondary - It includes students studying in classes nineth and tenth.

Higher Secondary- Includes students studying in eleventh and twelfth classes or otherwise called as plus one and plus two classes.

Undergraduate- It is considered as that part of higher education which is completed in college. The course may vary according to the subject pursued by the student. For medical students this stage is of four and a half years plus one year of compulsory internship, while a simple graduate degree can be obtained in three years.

Postgraduate - After completing graduation a student may opt for post graduation to further add to his/her qualifications.

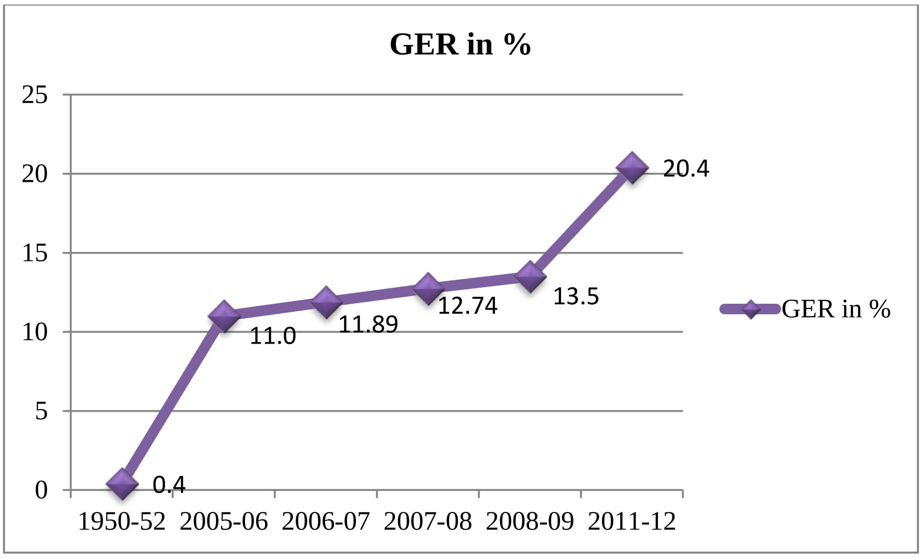
That area of education beginning from the undergraduate level or after the secondary education is considered as Higher education in India, regulated by the UGC Act of 1956 and there are many other supervisory and regulatory statutory bodies assigned with the role of ensuring quality and standards at a particular level of education. This consists of Distance Educational Council under the IGNOU Act, All India Council for Technical Education, Council of Architects, Medical Council of India, Pharmacy Council of India, Indian Nursing Council, Dental Council of India, Central Council of Homeopathy, Central Council of Indian Medicine, Rehabilitation Council of India, National Council for Technical Education, Indian Council for Agricultural Research, Bar Council of India.

The Higher Education structure embodying the above statutory bodies in India therefore envisages the need of manpower in each particular area of specialization and makes recommendations so as to ensure the quantity and quality of education. Among these bodies the most important role being played in the Indian education system is the All India Council for Technical Education (AICTE) that controls, supervises and regulates the system of Technical education in India formed in the year 1945.

An overview of the experiences in the higher education and technical education will definitely assist in the critical assessment of the achievements and failures in this sector of education. One of the universally accepted tools of the assessment is the Gross Enrolment Ratio.

2.3 Higher Education Enrolment in India and Kerala: Prospects and Future

Higher education in India however in the present state of affairs is not appreciable in terms of enrolment as the GER of Higher Education in India is much below of what is observed in the rest of the world.



Source: Higher Education Statistics, Ministry of Human Resource Development, Reports of various years

Figure 2.1 GER of Higher Education in India (1950 to 2011-12)

The Gross Enrolment Ratio is one of the popular and standard methods of measuring the educational achievements of a country. The gross enrolment ratio in any stage of education is the ratio of number of enrolment in that stage to the eligible population. The Gross Enrolment Ratio of Higher Education in India is 20.4 per cent and is comparatively very much lower indicating that only about one fifth of the population in the age group of 18-23 years have an access to higher Education in India. It is also observed that India's GER is not only much below the GER of developed countries and BRIC countries but also is below the world average of 29 per cent as of year 2010[5]. Economist Martin Trow classified higher education system world wide according to their enrolments. He defined the 'elite, 'mass and 'universal states as GER ratio of less than 15 per cent, between 15 and 50 per cent, and more than equal to 50 per cent

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5 UNESCO Institute for Statistics (http://www.uis.unesco.org/Education/Pages/Tertiary.educationaspx as accessed on 24th Oct 2012

respectively' (Trow, 1973)[6]. India with an enrolment ratio of about 20.4 per cent has moved to the mass higher education system only after 2011, but is still less than in countries like China, Brazil, Philippines, etc. Further there is a wide difference of GER between the rural and urban areas. In urban metropolitan areas, enrolment mirrors that in the advanced developing nations, while in the rural hinterland, enrolment continues to be very low and there is a clamor for increasing the enrolment rate to at least 20 per cent close to the global average of 29 per cent particularly when India enjoys a key role in the global knowledge economy.

But there are also conditions when high enrolment is a disguise rather than a blessing. This is because mere higher enrolment unmatched by an expansion in the productive sector puts high pressure in the labour market. The increase in enrolment without economic growth is therefore, futile. Hence educational expansion is to be in consonance with the requirement of the economy. This is a global phenomenon where the conditions are worse in countries that are not so fast growing economies. For instance it is observed that, there is a huge overcapacity in American higher education. Jobs held by college graduates in sales, transportation, services and even in computer industry can easily be performed by the people with little or no higher education. Going to college has become a defensive strategy- you do it because everyone is doing it (Clausen, 2006)'[7]. Similarly in China, unanticipated expansion of higher education has resulted in skyrocketing unemployment rate. Thus even if higher education has to play a greater social role it has to be in sync with the

[6] Trow, M. (1973). *Problems in the Transition of from Elite to Mass HigherEducation in India.* Berkeley, California: McGraw-Hall.

[7] Clausen, C. (2006, Autumn 2006). TheNew Ivory Tower-The US Higher Education. *The Wilson Quarterly, 30*(4), 31-36.

absorptive capacity of the economy. While some oversupply of qualified people would help the economy on higher productivity growth path, a large mismatch could result in an acute problem of unemployment and underemployment.[8] In India with low prospects of growth compared to China, a mere increase in the enrolment will worsen the condition of unemployment with incidence of unemployment to larger sections of the community.

Besides, there are arguments that question the reliability of GER as an effective tool for assessing the quality of education. An assessment based on the GER index of quantity of enrolment is insufficient to assess whether the standards in Higher Education in India is globally competitive. Higher Education scenario in India is that at the time of Independence, it lacked a national network of Universities that could provide outreach to a country with vast diversities. Even after fifty years, India has endowed to expand access to (i.e. provide a greater number of seats) higher education, but there does not appear to have been a corresponding focus on improving quality. Another study on the quality of engineering education which is also a part of higher education reveals that BRIC governments focused on increasing enrolment than raising quality and hence large number of non-elite institutions emerged which focused more on courses which maximise the number of students they can process "successfully" and yet still maintain demand[9]. This proves the fact that gross enrolment ratio is only a quantitative index without considering any tools of assessing the quality of education. However, still an understanding on the level of educational facilities available in a country or a region and its

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8 Agarwal, op.cit.

9 Prashant Loyalka, Martin Carnoy, Isak Froumin, Raffiq Dossani, J.B.Tilak, Po Yang. (2013).The Quality of Engineering Education in BRIC Countries. In *Working Paper* (Vol. 249). reapchina.org/reap.stanford.edu.

relative comparison can be done only on the basis of the gross enrolment ratio. The educational policies thus should aim beyond increasing enrolment to maintaining a balance between the various streams of education to prevent both the glut and dearth of available skilled manpower.

Table 2.2 GER of Higher Education among States and Union Territories in India

Name of the State/Union Territory	GER of Higher Education in %			Name of the State/Union Territory	GER of Higher Education in %		
	Male	Female	Total		Male	Female	Total
Andhra Pradesh	31.8	23.4	27.6	Mizoram	21.6	19.6	20.6
Arunachal Pradesh	36.9	24.9	30.9	Nagaland	22.0	13.7	17.9
Assam	14.5	14.2	14.4	Odisha	18.4	14.3	16.3
Bihar	14.7	11.2	13.1	Punjab	22.6	17.1	20.0
Chattisgarh	12.1	9.9	11.0	Rajasthan	20.8	14.9	18.0
Goa	34.9	40.4	37.4	Sikkim	31.2	24.4	27.9
Gujarat	19.3	15.7	17.6	Tamil Nadu	41.1	35.2	38.2
Haryana	28.4	27.3	27.9	Tripura	14.2	9.1	11.6
Himachal Pradesh	25.7	24.2	25.0	Uttar Pradesh	15.6	18.1	16.8
Jammu and Kashmir	22.6	24.9	23.7	Uttrakhand	26.5	27.9	27.2
Jharkhand	9.1	7.6	8.4	West Bengal	14.7	10.7	12.8
Karnataka	25.2	22.8	24.0	Andaman and Nicobar Island	11.6	14.9	13.1
Kerala	19.3	26.9	23.1	Chandigarh	52.4	53.8	53.0
Madhya Pradesh	19.8	14.6	17.4	Dadra & Nagar Haveli	6.2	7.1	6.5
Maharashtra	29.7	24.8	27.4	Daman & Diu	3.0	7.6	4.2
Manipur	32.3	34.4	33.4	Delhi	35.7	33.6	34.8
Meghalaya	14.3	18.3	16.4	Puduchery	39.1	35.1	37.1
All India	21.6	18.9	20.4				

Source: Higher Education Statistics, Ministry of Human Resource Development, 2013 (Data for the year 20011-12) All India Survey or Higher Education.

In India the problem in education is more complex as the GER is varying across states which further puts pressure on the policy makers to ensure equality as envisaged in the objectives of planning. The state wise comparison of GER of Higher Education in India is shown in the table and it indicates that the highest GER among the states and union territories in India is in the state of Tamil Nadu and in the union territory of Chandigarh whereas it is lowest in the state of Jharkhand and in the union territory of Daman and Diu.

While the data of the GER among the states in India indicate a wide disparity in higher education, Kerala shows a lower GER, as many of those states considered backward have an enrolment rate greater than that of Kerala. But the gender parity index of 1.39 for the state of Kerala is impressive as the value is much higher than the national average of 0.88 and also above all the states except the union territory of Daman and Diu where it is 2.53.

The GER of the students in various kinds of education shows that at undergraduate level the gross enrolment ratio in engineering and technology is 18.89 next to the enrolment in arts. But again, the Gross enrolment ratio in engineering at all India level shows that the female enrolment is only half of the males whereas in Arts and Science the female GER is higher than the males. In Kerala also the female intake in engineering is much below the males as observed in the various reports of Annual Technical Manpower Review. Hence the figures shows that a true gender bias against females exist in engineering education in India and also in Kerala.

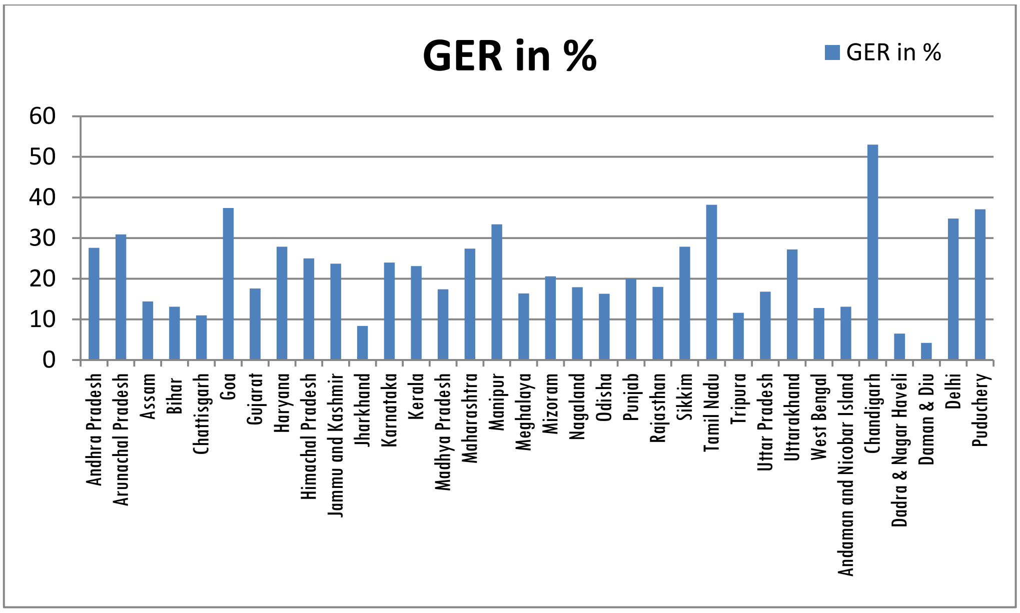

Figure 2.2 Gross Enrolment Ratio of Higher Education in States and Union Territory in India

However GER of higher education alone is inadequate to make an assessment of the buoyancy of technical education. The other means of assessing the strength of technical education are the number of institutions and the student intake level. Though there is large number of institutions offering technical education, the engineering education is considered the most important one and the present study makes an evaluation of the scope of technical education in Kerala on the basis of the stature of engineering education in India and Kerala.

2.4 Technical Education in India: Its Evolution and Growth before and after Independence

2.4.1Technical Education Development in the pre Independence period

Technical education is that part of education offered at a higher level aiming at imparting technical skills to enhance the productivity of labour through innovations prospering mankind. The technical education imparted at various levels, with the initial stage beginning from the technical schools, is aimed at the creation of skilled technical personnel and development of technical aptitude inculcating the spirit of science and technology for upgrading the technical base of the country through increased production and economic growth.

In India technical education did not exist in the modern sense during the ancient period, but scientific knowledge so essential for human life was promoted and encouraged. The formal education system for technical education began to get attention from the period of the 3rd and 4th decade of the 19th century under colonial rule (Mukherjee, 1964)[10]. Technical schools were opened by the British to meet the growing demand for engineering professionals for supervising the construction of public works undertaken. The historical facts reveal that the first technical institution established was the Industrial school established at Guindy in Madras in the year 1842[11]. In 1847, the first engineering college was started at Rourkee followed by the starting of two more colleges at Sibpur (1856) and Madras(1858).The Wood's Despatch of 1854 realized the need for providing technical and practically useful education to Indians. It recommended to the Court of Directors the establishment of an engineering class at Rourkee that was already working. Earlier in 1854, a mechanical engineering school was also started in Poona (SN Mukherjee, opcit. p.286). The private effort in this direction was materialized by the foundation of the Victoria Jubilee Technical Institute in Bombay in 1887(Mukherjee,p.287). In

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[10] Mukherjee, S. N. (1969). *Education in India, Today and Tomorrow.* Acharya Book Depot.

[11] Kamlesh, R. (1955). Status of Engineering Research on India. *Journal of Institutions of Engineers, 36*(3 PTI), 1313.

the resolution of 18th June 1888, the Government of India observed that the course content was more of literary nature. Consequently the necessity of giving a more practical aspect to technical education was emphasized and the immediate result, though negligible, was the provision for technical training of engineers (Report of Indian Industrial Commission, 1916-1918, para 138).

By 1901-02, there were eighty technical schools with a total enrolment of 4894[12]. Of these, four were managed by the colonial government, sixteen by the local bodies, three by the Indian states and fifty seven by the private agencies, most of which were Christian Missionaries. Again in 1904, the enlightened citizens of Calcutta formed a body known as the Association for the Advancement of Scientific and Industrial Education and began to send a number of Indian students for advance studies to foreign countries. The students were sent to Europe and America for studies in technical fields. According to Indian Education Policy 1913, out of 73 scholars, 36 did not return to India (Indian Education Policy1913, p24-25). The National Council of Education in Bengal established a college of engineering and technology at Jadavpur in 1906. This college started granting diploma in mechanical and electrical engineering courses in 1908, and in 1912 it started degree classes. The credit for organizing degree classes in mechanical and electrical engineering and metallurgy for the first time in India goes to the University of Banaras in 1917 (S.N.Mukherjeee). Also in 1917 an engineering college was started in Bangalore by the Government of Mysore (Karnataka, Department of Technical Education in Karnataka 1980-81). Between 1921 and 1939 a number of institutions were established. Some of the premier colleges

[12] Indira, R. *A Sociological Study of Engineering Education in India.* Ph.D. Thesis, University of Mysore.

established during the period include the Indian school of Mines at Dhanbad , the Harcourt Butler Technological Institute at Kanpur, the School of Chemical Technology at Bombay, Government Engineering College, Jabalpur, CD College of Engineering, Ahmedabad, Indian Institute of Science, Bangalore, College of Engineering, Trivandrum[13].

2.4.2 Technical Education Developments in India, post Independence

Long before Pt. Jawaharlal Nehru became the Prime Minister, it was believed that science could solve the problems of hunger and poverty, of insanitation and illiteracy, of superstition and deadening customs and traditions. The future belonged to science and also those who made friends with science. The growth of science and technology in India is a development of this idea. Nehru urged scientists to descend from their ivory towers and concern themselves with the effects of their poorer brotheren. He wanted scientists to do all they could, to stimulate development for plenty and peace[14]. Pt Jawaharlal Nehru reposing immense faith in the role of science and technology with the objective of modernizing the industrial and economic structure of India, urged scientists to engage themselves in their mission. Thus in the earlier five year plans, particularly in the second five year plan 19 per cent of the expenditure on education was set aside for the growth of technical education. To coordinate the working of technical education across India, the AICTE founded in the year 1945 was empowered with special powers of supervising and regulating the entire technical education in India. The main function of the AICTE along with its

[13] Sarala, G. *Evolution of Technical Education in India during First Five Year Plan.*

[14] Thacker, M. S. (1977). *Development of Technical Education in India, Science and Technology in India*. New Delhi: Vikas Publishing House.

constituent boards is to lay down guidelines on broad principles, problems and programmes of technical education to ensure high academic standards in technical colleges and to lay down standards and syllabi in a variety of subjects. Later, Govt. of India appointed Sarkar Committee to consider whether we should have several regional technical institutions or one central all India technological institution with affiliated colleges spread over the country. Thus five IIT's were established with IIT Kharagpur in the year 1951, IIT Bombay and Madras in the years 1958, 1959 respectively and IIT Kanpur and Delhi in the years 1960 and 1961 respectively[15]. Similarly 15 Regional Engineering colleges subsequently came into being one in each state as a joint and cooperative enterprise of the central and state governments. The regional engineering colleges are presently known as National Institute of Technology. Besides these each state has its own engineering colleges affiliated to various Universities and diploma institutions providing a good base for the promotion of technical education in India.

2.5 Engineering Education in Economic Planning and the Beginning of Manpower Planning Process in India

The post independent Indian economy placed much emphasis on the planned economic development. This necessitated preparation of a comprehensive framework on the objectives and strategies to be adopted in each five year plan. The manpower planning is a prerequisite for the successful implementation of a five year plan. Manpower planning is an integral part of the economic plans formulated by the Central and State governments and their agencies, and, within their own specific fields, by industrial associations and their

[15] Thacker M S. Op.cit

organizations representing different activities or interests as well as by individual undertakings and institutions, both public and private[16].

The genesis of manpower planning in our country may be traced to one of the resolutions of Indian National Congress adopted as early as in 1887 which, among other things, stated that'……having regard to the poverty of the people, it is desirable that the Government be moved to elaborate a system of technical education, suitable to the conditions of the country and to employ more extensively than at present the skill and talents of the people of the country"[17].

However it was only after the World War II that some concrete steps were taken in the wake of post war reconstruction plans. It had been realized by then that problems of poverty, unemployment, national defence and economic development could not be solved without planned large-scale industrialization. A large number of industrial panels were accordingly setup to prepare short and long term targets of production in almost all the important industries of the country and to recommend the steps to be taken thereof. About the same time, two Expert Committees were also setup to prepare long term plans of development of a national educational system and a national health organization, viz. the Sargent Committee on Education (1944) and the Health Survey and Development Committee (1946).

In the post independence period the Government of India set up the Scientific Manpower Committee(1947) to recommend, among other things,

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[16] NTMIS, Bullettin. (2005). *A Quarterly Publication of National Technical Manpower Information System* , *X* (4).

[17] Ibid

long-term plans of development of technical and scientific education. In the wake of the Scientific Manpower Committee (1947), other committees, came up in quick succession, they were the River Valley Projects Technical Personnel Committee (1954), Engineering Personnel Committee (1956), Agricultural Personnel Committee (1957) and the Working Group on Technical Education and Vocational Training (1959).

Later in the year 1962 in pursuance of the greater significance attached to the manpower planning for the country’s future development an Institute of Applied Manpower Research was setup and also a Technical Manpower Committee formed with representatives from the Defence Ministry, the Planning Commission and the other Ministries concerned. The committee set up Working Groups to deal with specific problems like engineering, medical personnel, craftsmen training programmes, etc.

In October 1968, the Planning Commission set up a Sub-Group on Manpower under the Working Group on Employment and Training to examine the manpower requirements for the Fourth as well as Fifth Five year Plan.

The Steering Group on Engineering Manpower of 1973 was constituted by the Planning Commission for the formulation of fifth five year plan which in turn setup a task force and the task force was asked to cover specifically the programmes of technical education which come within the purview of the All India Council for Technical Education, and Vocational Training and Apprenticeship Programmes under the National Council for Training in Vocational Trade and the Central Apprenticeship Council. The Steering Group took recourse to the various studies made by different organizations to estimate engineering manpower requirements for the fifth Five Year Plan. It went into the problem of stock, supply, utilization and demand for different categories of personnel and recommended that the manpower requirements for the fifth Five Year Plan may be made on the basis of studies made by different organizations.

For the sixth Five Year Plan, Ministry of Education and Social Welfare appointed a Working Group of Technical Education which suggested, inter alia, setting up of a National Manpower Information System. A review of the various committees, working groups and steering committees reveals that they based their recommendations on either existing data or on certain norms evolved for specific purposes or on ad-hoc studies done by organizations like Institute of Applied Manpower Research, Council of Scientific and Industrial Research, Directorate of Employment and Training, etc. So far none of these groups provided the basis for projecting manpower requirements on a long term.

The National Technical Manpower Information System (NTMIS) was set up by the Ministry of Education and Culture (now MHRD), Government of India, towards the end of 1983, with a view to generating and maintaining a reliable database and relevant information needed for planning and administration of technical education. The erstwhile NTMIS was with the Ministry and it has been transferred to the All India Council for Technical Education (AICTE). A systematic data collection from the three respondent groups of the engineering students, engineering educational institutions and the users of the technical manpower provides the necessary data base. The data collection is meant to provide an insight into the demand and supply situations- both current and prospective- of different categories of engineering and technical manpower and to facilitate identification of policy and options in the field of engineering education at the state and national level. The organizational structure of NTMIS comprises a Lead Centre at the Institute of Applied Manpower Research (IAMR), A Manpower Cell in the All India Council for Technical Education, 17 Nodal Centres located mostly in higher engineering and technical educational institutions, and four Nodal Centres under the four Regional Boards of Apprenticeship/ Practical Training forming the organizational structure of NTMIS. Till 2008 necessary inputs on the various aspects of technical education including the number of qualified engineers from various educational institutions, the number of engineers placed in various organizations, their emoluments, etc. were provided by this agency[18]. It provided a good database to the planning commission on the available technical manpower necessary for effective manpower planning of technically qualified personnel.

2.6 Engineering Education in India: Its Present Global Position, Stature and Characteristics

The global phenomenon witnessed far reaching developments in the field of engineering education in the recent past. Three decades ago the majority of the world's engineers belonged to United States and Japan. Today a high fraction of the world's new engineering graduates come from the four largest emerging economies: Brazil, Russia, India and China (NSB,2010)–collectively known as the BRIC countries[19]. The massive increase of the new engineering graduates in the BRIC countries has the potential to profoundly

[18] NTMIS,B. (2004). *A Quarterly PublicationofNational Technical Manpower Information System , X* (2-3).

[19] National, S. B. (2010). *Science and Engineering Indicators 2010.* National Science Foundation, National Center for Science and Engineering Statistics. Arlington: http://www.nsf.gov/statistics/send/10.

influence domestic and international high skilled labour markets (NAS 2010: Lynn and Salzman, 2011)[20]. But the findings are that only a minority of BRIC engineering students receives high quality training in elite institutions while the majority receives low quality training in non-elite institutions. The number of engineering enrolments in elite versus non-elite institutions differs substantially across the BRIC countries. The estimate are that by 2009, China had the most engineering students in non-elite institutions (~3 million), followed by India (~1.4 million), Russia(~ 700,000), Brazil (~ 350,000). China also had the most engineering students in elite institutions followed by Russia, Brazil and lastly India.

Beyond numbers, the level of preparedness of the incoming engineers also differs by country. With the exception of Russia, it is the “cream” of each age cohort (in terms of innate ability, motivation, and social class) that is sorted into higher education through a competitive admission process. Thus in India large number of engineering outturn is largely represented by the upper castes and also from the non-elite institutions thereby undermining the equality and quality of engineering.

Another international comparison of engineering statistics shows that the population of graduate engineers in the world is highest in China followed by India since 2002 but the engineers per million population reveals that it is highest in South Korea and secondly Japan. The growth rate of graduate engineers is highest in India along with a noticeable negative growth of graduate in USA[21].

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[20] Lynn L and H Salzman. (2011). *Is the President Right when he Says the United States Needs 10000 Engineers a Year? Why not let the Market Decide?* http://www.manufacturingnews.com/news/11/1031.

[21] Rangan Banerjee and Vinayak P Muley. (2007). *Engineering Education in India.* Observer Research Foundation.

In India, presently engineering education is imparted at diploma, graduate level and above. Education being in the concurrent list there are central institutions as well as state institutions that impart technical education. Thus policies of the centre and the respective states widen the scope of technical education in a particular state or region and this also undermine its scope in other states or regions. This has resulted in a wider disparity in the number of engineering institutions functioning in the various states in India particularly in the post independent period.

It is observed from the statistics as published by the AICTE that the technical institutions are largely concentrated in the southern part of India and among the states the largest number of technical institution is in the state of Tamil Nadu and is followed by the state of Andhra Pradesh and Maharashtra and the relative strength is however likely to change with the formation of the state of Telangana. The region-wise distribution of the engineering colleges shows that around 38 per cent of the engineering colleges are concentrated in the southern part of India. The intake into the engineering institutions as in the year 2006 shows that it is highest in the state of Andhra Pradesh whereas the intake per million population is high in the Union Territory of Puduchery[22].

2.7 Engineering Education, Scope and Importance in Kerala Perspective

The state of Kerala had only one institution imparting engineering education at the dawn of independence. This was the College of Engineering at Thiruvananthapuram established in the year 1939. The first polytechnic of the state was started in the year 1946-47 at Calicut. Till 1955, there were not many additions to the technical institutions in the state. During late 1950s one

[22] Vinayak, P. M. (2007). *Engineering Education in India.* Bombay: IIT Bombay.

Government engineering college and two private engineering colleges were established. Technical education at the diploma level received much recognition during the period 1955 to 1965 when 13 more polytechnics started functioning in the state. The number of institutions remained almost stagnant till 1980. By 1990, the number of polytechnics in the state was 32 and there was a further spurt in the number of institutions after 2001, when self financing institutions were sanctioned to impart engineering education particularly at graduate level. The other institutions imparting engineering education are one College of Fine Arts and six University departments at degree and P.G. levels[23]. The number of engineering institutions since 1947 in the state is given in the Table 2.3.

Table 2.3 Number of Engineering Institutions in Kerala

Year	Degree	Annual growth(%)	Diploma	Annual Growth(%)
1947	1		2	
1950	1	0	2	0.00
1955	1	0	3	10.00
1960	4	60	11	53.33
1965	6	10	15	7.27
1970	6	0	18	4.00
1975	6	0	18	0.00
1980	6	0	19	1.11
1985	7	3.33	25	6.31
1990	9	5.71	29	3.20
1995	16	15.55	42	8.96
2001	45	30.2	56	5.55
2002	77	71.11	56	0.00
2005	91	6.06	58	10.71
2008	94	1.09	58	0.00
2011	142	17.02	58	0.00
2014	163	4.92	64	0.00
Average		14.05		7.02

Source: NTMIS Bullettin and Commissioner of Entrance Examination, Kerala

23 NTMIS Bulletin. (2003). *A Quarterly Publication of National Technical Manpower Information System, VIII* (4).

The number of institutions in the state for the period 1947 to 2014 reveals an uneven growth of the engineering colleges in Kerala. For the period 1947 to 2001 the diploma institutions outnumbered the degree institutions and thereafter there was a sudden spurt in the growth of engineering degree colleges leading to an imbalanced growth. As in the year 2014 there were 163 engineering degree colleges, which is around three times of the diploma institutions. The average growth of the graduate institution is also around two times that of the diploma institutions during this period. The unchecked growth of these institutions also leads to a massive outturn of engineers in numbers with undesirable consequences in the engineering labour market. The opinion of the experts functioning in the academics of technical education also report of deteriorating quality of engineering manpower as there is a manifold increase in the quantity of intake.

The comparison of the figures of the outturn of passed engineering graduates during the period 1986 to 2009 is shown in the table (Appendix II, Table 2.1) and it reveals a steady increase in the number of engineering degree holders and diploma holders. The outturn figures as revealed in the table also indicate that till the year 2003 the outturn of the diploma engineers in Kerala was greater than that of the degree engineers. But since the year 2004 the outturn of the degree engineers has crossed the number of diploma engineers. The outturn of the graduate engineers greater than that of the diploma is primarily because of the high growth of graduate institutions than the diploma institutions in the state. A comparison of the average growth of the graduate engineering institutions with the diploma in the state of Kerala reveals this fact.

Considering the fact that the engineering education at diploma and graduate levels forms the large chunk of population in the technical education, its growth both in absolute numbers of intake and outturn is impressive and at the same time astounding . Similarly the outnumbering of engineering colleges over the other institutions in recent times establishes the popularity of choice of education at undergraduate level for the technical courses particularly engineering diploma and degree courses. But the other argument is that the higher outturn of engineering graduates has not only failed to improve but also impaired the existing quality of technical education in India in recent times.

There are various means through which the quality of education can be tested. One of the means of assessing the quality of education is the level of academic achievement and the other means of assessment is the level of employment particularly for professional education. To what extent the engineering education in Kerala has succeeded in accomplishing this goal of ensuring maximum employment opportunity among both the engineering diploma holders and graduates is to be essentially known and an attempt is made here in this direction

2.8 The Framework of the Analysis

The engineering education being designed to train engineers for the engineering profession should necessarily meet the challenges and needs of the growing economy. The transformation of the inputs into the desired level and quantity of engineering output forms the entire process of engineering education system. The framework of analysis is given in the figure 2.3.

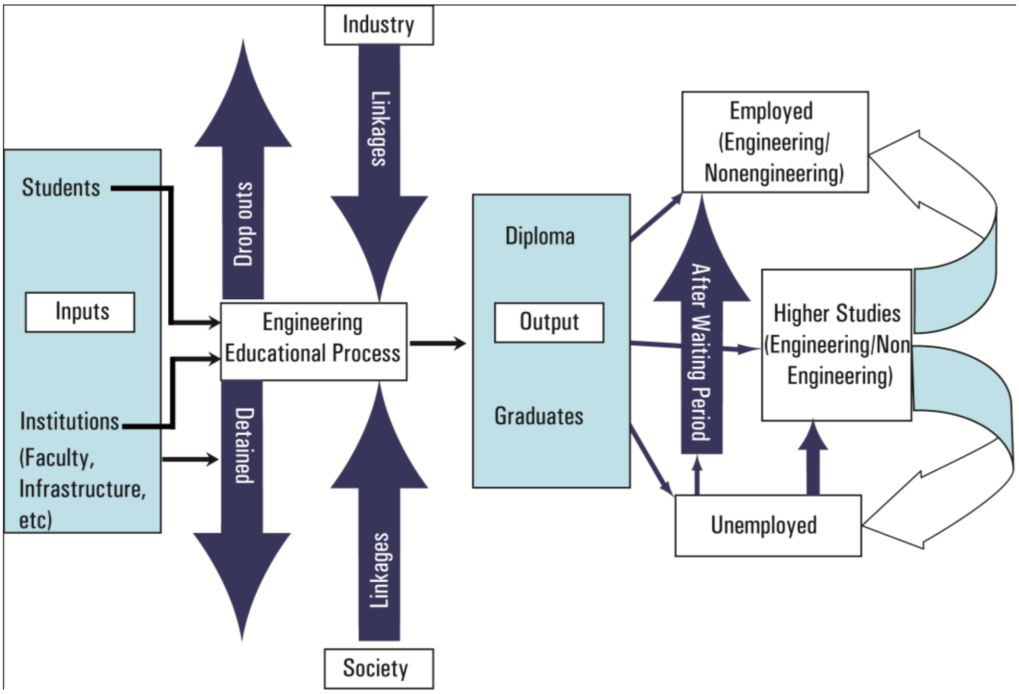

Figure 2.3 Framework of the Analysis of the Present Study

The inputs consist of the students and the institutions including the faculty and infrastructure provided in the institutions which enter the engineering education process. The process is further strengthened by the linkages provided by the industry and society. However there are some leakages that reduce the quantum of output including the dropouts and detained students and withdrawal of some institutions from the system.

The engineering educational process produces output that consists of both the diploma holders and graduates. A part of it is employed in the labour market, another part pursues higher studies and the rest is retained as unemployed. After pursuing higher studies some succeed in getting employment, whereas the others add to the existing lot of unemployed that change over a period of time as the waiting period of employment varies across various characteristics of the output. This is because the already unemployed after a waiting period also get absorbed in the labour market which is either in the engineering or the non- engineering services and still others join for higher studies either to keep in disguise their state of unemployment or to enhance their employment prospects.

The present study, therefore, focuses on the employment characteristics of the engineers, the students opting for higher studies and the problem of unemployment among the engineers.

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Chapter 3

ACTIVITY STATUS OF FRESH DEGREE AND DIPLOMA ENGINEERS IN KERALA: ISSUES AND CHALLENGES

Contents

3.1 Introduction

The educational system comprising primary, secondary and higher secondary levels forms part of the general education in Kerala and those at undergraduate and postgraduate levels including the professional courses and technical education, forms an integral part of higher education. In recent times the growing need for higher education resulted in the proactive role by the private players in the field of education where they made heavy investment along with their participation in this area. The increasing demand for professional education by the students and parent community attracted many of the greedy profiteers to invest in the field of education in the banner of self-financing institutions.The government also promoted the growth of these institutions at the higher education level even if the situation did not demand any expansion of such institutions, anticipating that a part of the professionals coming from the institutions will cater to the global demand without producing high pressure on the labour market in the domestic economy. As the quantity of the professionals increases, the quality of education at the professional level is diluted, undermining the prospects of employment of the students who are professionally qualified particularly among those who are considered as technical professionals known as engineers[1]. The disproportionate rise in a particular stream of education has resulted in an imbalance leading to the outturn of under skilled or unemployable manpower manifested in the form of a huge army of unemployed youth.(Harikumar,2009)[2]

The present chapter attempts to highlight the activity status of the fresh engineers in Kerala who passed the diploma course or graduated in the year 2009 and thereby identify the number of engineers employed or pursuing higher studies and the rest who are unemployed.

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[1] Hone, A. (1968, April). Unemployed Engineers. *Economic and Political Weekly, III*(15).

[2] Harikumar S and Ramadevi T. (2009). Higher Education System in Kerala: An Overview. In *Technical Education in Kerala-Emerging Trends.* Serial Publications.

3.2 Activity Status of Present Diploma and Graduate Engineers in Kerala – an overview

The activity status of the engineers after two years of the completion of their course is collected from the engineering students hailing from 58 diploma institutions and 94 graduate institutions. The activity of the engineers comprises various forms.

3.3 Activity Status: its Different forms

The Keynesian involuntary unemployment ideology forms the basis of drawing a distinction between employment and unemployment where employment is considered to be a state where an able bodied individual is disposed with an opportunity to contribute towards production of goods and services resulting in the generation of income for the services rendered. The condition of unemployment on the other hand is a state of involuntary idleness due to lack of work excluding idleness imposed due to labour disputes, vacations, etc. caused by cyclical,structural, neutral and other frictional factors.

The dynamism of market driven employment condition reveals a wide disparity existing even among the engineers with respect to the various activities in which they are engaged and it is highly influenced by characteristics such as the branch of their study, their gender characteristics, the region of their study, etc[3].both at the diploma and degree levels. The activity status after two years of passing are identified and classified as employed on paid job as a wage employee, self employed, on contract job,

[3] Ashok Mathur and Rajendra P Mamgain. (2002). Technical Skills, Education and Economic Development in India. *The Indian Journal of Labour Economics, 45*(4).

seeking apprenticeship training, and the rest are either pursuing higher studies or are unemployed.

a) On Regular Paid job

On paid job an employee is working for a remuneration offered as wages for the work done, treated as permanent and regularly employed on the basis of a predetermined wage rate. On paid job an engineer is found working more in the organized sector, where the conditions of employment are more favorable with structured wages and timely revision. The unorganized is not at all a destination of employment among the engineers. In the status of being a paid employee, the employee is not functioning in the capacity of an employer. The paid job constitutes the major avenue of employment for engineers in the activity status.

b) Self Employed

They are those who are working in a firm owned by them. Thus self employed engineers are not merely a waged employee but they are also the proprietor of the firm they own.

c) On Contract job

The contract job holders here refers to those group of engineers who are not permanently employed and hence not eligible for the benefits enjoyed by other permanent employees in the organization coupled with no guarantee of employment in the future. Hence engineers working on contract job cannot be treated as fully employed in its strict sense.

d) Apprenticeship Trainee

Many of the engineers undergo apprenticeship training to consolidate and strengthen their learning skills acquired through classroom learning by exposing themselves to practical based training in order to increase their scope of employment in their respective braches of study, arranged by the institution or through other governmental agencies. The apprenticeship training, therefore, provides an opportunity for engineers to experiment with the acquired skills of engineering learned during their course of study.

e) Pursuing Higher studies

It is also observed that some of the students pursue higher studies instead of accepting employment either because of self interest or due to unemployment. A diploma engineer here may pursue B.Tech. degree and a B.Tech. degree holder may pursue a M.Tech. degree. The engineers pursuing courses other than engineering after passing engineering diploma or degree are also treated as pursuing higher studies because it also offers them a higher degree and is an addition to the existing level of acquired qualification.

f) Unemployed

The engineering students who fail to earn income for want of potential employment source in their post study period are considered to be unemployed. The unemployed engineers here are involuntarily unemployed because after a waiting period of two years of completion of their study in the respective courses, these students fail to get absorbed in the labour market. This incidence of unemployment is due to no job offers or non-acceptance of job of engineers from the non technical area with a paltry salary. The magnitude of the problem of unemployment among engineers is extensive in Kerala with a high incidence of unemployment both among the diploma holders and graduate engineers. It is again observed that there exists a wide difference in the rate of unemployment within each course, if the population is stratified into various categories with respect to their branch of study, gender, region of their study, type of institution, etc.

The present chapter attempts to unveil some of the findings observed in this regard particularly the magnitude of employment and unemployment among engineers both at the diploma level and graduate level. The study emphasizes the various aspects of the activity of the engineers among the diploma and graduates passed in the year 2009, which is a primary data analysis. At the same time the activity status of the engineers during the previous years based on the reports of NTMIS is also analyzed to make a comparison of the findings of the secondary data with the primary data

3.4 Activity Status of the Diploma and Graduate Engineers in Kerala During the Period of 1980's to 2008: Descriptive Analysis of Secondary Data

The information regarding the activity status of the engineers available from the published reports of the NTMIS, Kerala, is gathered to have preliminary information about the various activities in which the engineers are engaged after passing their courses.

Table 3.1 Activity Status of the Diploma Engineers in Kerala (1986-2008)

Year	Activity Status of the Engineers (in%)					
	Employed	**Self Employed**	**Apprentice Trainee**	**Higher Studies**	**Unemployed**	**Other**
1986	33.37	0.98	12.30	1.87	45.33	1.53
1987	32.44	3.73	12.10	2.93	45.49	1.14
1988	34.70	3.30	9.40	2.80	48.60	1.30
1989	37.30	4.70	9.60	5.00	42.60	0.80
1993	35.10	3.70	12.10	5.10	42.40	1.50
1993	42.00	2.10	12.10	6.30	36.00	1.50
1997	38.30	2.20	18.00	7.70	31.00	2.80
2000	38.50	1.10	17.80	8.20	30.90	2.10
2001	35.50	1.00	16.30	9.20	35.10	1.70
2002	27.30	1.00	18.30	12.20	38.30	1.90
2003	27.70	0.80	14.90	11.50	41.60	2.50
2004	28.30	0.40	13.80	16.44	37.50	2.40
2005	33.60	0.30	12.30	14.90	35.40	2.30
2006	29.00	0.80	14.10	24.10	30.00	1.20
2007	36.00	0.50	11.80	23.10	27.10	0.70
2008	43.76	0.00	7.70	31.10	17.43	0.00
Average	34.55	1.66	13.29	11.40	36.55	1.59

Source: Annual Technical Manpower Review Reports Various Years, NODAL Centre, Kerala

The activity status of the diploma engineers shows that the magnitude of the problem of unemployment among the diploma engineers over the years is extensive with an average unemployment rate of 36.55 per cent indicating that a large number of work force in this category remains underutilized. At the same time it is also observed that there is a positive growth of employment and the unemployment rate among them was declining during later period.

The activity status of the graduate engineers will also help in gathering preliminary information of the different activities in which the passed graduate engineers are engaged.

Table 3.2 Activity Status of the Graduate Engineers in Kerala (1986-2008)

Year	Activity Status of the Engineers (in%)					
	Employed	Self Employed	Apprentice Trainee	Higher Studies	Unemployed	Other
1986	70.66	2.06	3.54	10.52	10.23	0.29
1987	62.10	1.49	7.30	6.24	18.30	1.30
1988	64.10	3.20	4.50	8.30	18.90	1.00
1989	57.00	4.00	6.90	12.00	19.90	0.10
1993	55.00	2.40	10.50	9.80	20.80	1.80
1993	59.50	1.20	11.10	15.70	11.90	0.60
1997	65.00	1.00	7.60	11.70	12.10	2.60
2000	66.90	0.90	4.20	10.90	14.00	2.80
2001	60.10	2.20	4.30	15.30	16.20	1.50
2002	61.40	1.00	5.00	12.50	18.00	1.60
2003	65.70	0.80	3.60	12.40	16.40	0.90
2004	66.21	0.53	3.88	17.01	11.20	0.99
2005	72.40	0.50	2.70	14.40	8.80	0.70
2006	64.60	0.80	3.10	20.30	10.90	0.30
2007	75.90	0.20	1.80	14.50	7.10	0.20
2008	53.50	0.06	1.45	13.82	30.50	0.00
Average	63.75	1.40	5.09	12.84	15.33	1.04

Source: Annual Technical Manpower Review Reports Various Years, NODAL Centre, Kerala

The activity status of the graduate engineers, however, shows that the magnitude of the problem of unemployment among them is less intense when compared with that of the diploma engineers. This is because the average employment rate is 63.75 per cent whereas the unemployment rate is only 15.33 per cent. At the same time, the trend reveals a declining rate of employment and increasing rate of unemployment in the later years. This was primarily because the outturn of engineers at the graduate level in Kerala after 2000 witnessed tremendous growth with the inception of new engineering colleges.

The primary data is also collected in order to assess the present activity status of the passed engineer. The primary data are further analyzed on the basis of the branch of study, gender, region, etc., to examine their unique features.

3.5 Activity Status of the Diploma and Graduate Engineers in Kerala: Inferential Analysis of the Secondary Data

The activity status of the engineers based on the data of the activity status of the engineers is classified into two periods, the years before 2001 and years since 2001. In Kerala the engineering education witnessed significant changes only after 2001 with the opening of new engineering colleges, particularly at the graduate level. Thus changes in the activity status during these two important periods are subjected to an independent ‘t’ test with equal variance assumed. The test reports for both the diploma and graduate engineering are given in the table 3.3 and 3.4 respectively

Table 3.3 Activity Status of the Diploma Engineers During Pre and Post 2001 Period: 't' Test Results

Activity Status	Mean Values in %		Mean Difference	t Value	Sig (2- tailed)
	Pre 2001years	Post 2001years			
Employed	36.46	32.64	3.82	1.654	.120
Self Employed	2.72	0.60	2.12	4.340	.001***
Apprentice Trainee	12.92	13.65	-0.73	-.448	.661
Higher Studies	4.98	17.81	-12.83	-4.587	.000***
Unemployed	40.29	32.80	7.49	2.056	.059*
Others	1.58	1.58	0.00	-..010	.992

***significant at 1%,** significant at 5%

The independent't' test is carried to understand the difference in the activity status of the engineers before and after 2001. From the table it is clear that the fall in the rate of self employment, an increase in the rate of higher studies and fall in the rate of unemployment are statistically significant.

Similarly the changes in the activity status of the graduate engineers before 2001 and after 2001 is also analysed with the independent sample 't' test. The test results are shown in table 3.4

Table 3.4 Activity Status of the Graduate Engineers During Pre and Post 2001 Period: 't' Test Results

Activity Status	Mean Values in %		Mean Difference	t Value	Sig (2- tailed)
	Pre 2001years	Post 2001years			
Employed	62.53	64.97	-2.44	-.790	.442
Self Employed	2.03	0.76	1.27	2.771	.015**
Apprentice Trainee	6.95	3.22	3.73	3.435	.004***
Higher Studies	10.64	15.02	-4.38	-3.257	.006***
Unemployed	15.76	14.88	0.88	.292	.774
Others	1.31	0.77	0.54	1.294	.217

***significant at 1%, **significant at 5%

The independent 't' test results show that the fall in the rate of self employment and apprentice trainees and on the other hand an increase in the rate of engineers pursuing higher studies are statistically significant. The change in the rate of employment and unemployment between these two periods is not statistically significant.

Similarly a comparison between the activity status among the diploma and graduate engineers is analyzed on the basis of the canonical discriminant function. The summary of the result is given in Table 3.5.

Table 3.5 Summary Result of Canonical Discriminant Function of Engineers

Category	Activity Status	Test of Equality of group Means			Eigen Value	Canonical correlation	Wilks' Lambda	Chi-square	Sig.
		Wilks' Lambda	F	Sig.					
Period of Study(Before 2001/ 2001 and after)	Employed	1.00	.015	.904	2.065[a]	.821	.326	31.359	.000***
	Self Employed	.541	25.402	.000***					
	Higher Studies	.541	25.447	.000***					
	Unemployed	.972	0.850	.267					
Course of Study (Diploma/ Degree)	Employed	.118	223.35	.000***	7.493[a]	.939	.118	59.898	.000***
	Self Employed	.989	.344	.562					
	Higher Studies	.987	.387	.538					
	Unemployed	.291	73.252	.000***					

*** significant at 1% level

The canonical discriminant function between the two periods (before the year 2001 and since 2001) and between the diploma and graduate engineers is analyzed based on their activities. The discriminant analysis shows that the activity of the engineers determines the period of their study and also the course of study. The mean difference of self employed and those going for higher studies is statistically significant for the period of study. The canonical correlation based on the period classification is 0.821. The result also shows that around 68 per cent of the changes in activity will explain the period of study. The unexplained change is only 32.6 per cent according to Wilks' Lambda value.

The discriminant analysis also shows that the mean difference of employed and unemployed is statistically significant for the type of course. The canonical correlation is 0.939. The result shows that 88.17 per cent of changes in the activity explain the course of study and Wilk's lambda value shows that only 11.8 per cent of changes in activities do not explain the course of study of engineers.

In order to test the validity of the findings as observed in the secondary data given in the NTMIS reports regarding the activity status of the diploma and graduate engineers, the primary data is also collected for empirical analysis. The primary data are further analyzed on the basis of the branch of study, gender, region, etc., to examine their unique features.

3.6 PresentActivity Status of the Diploma and Graduate Engineers in Kerala and Their Branch of Study: Descriptive Analysis of the Primary Data

3.6.1 Activity Status of the Diploma and Graduate Engineers and Their Branch of Study

The diploma engineers and graduate engineers in Kerala during 2009 are analyzed with respect to their activity status after passing their courses in various branches of study.

Activity status: the profile of diploma engineers

As stated, the diploma engineers in 27 branches seek employment or pursue higher studies either in technical or non technical stream of education. The employment is in the form of paid job or self employment or on contract job or as apprentice trainee. The rest of the engineers are unemployed. The status of these engineers is given in the table 3.6 and discussed as per the results obtained.

Table 3.6 Activity Status of the Diploma Engineers in Kerala and Their Branch of Study

Branch	On Regular Paid Job		On Contract Job		Apprenticeship/ Trainee Employee		Pursuing Higher Studies		Unemployed		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Civil, Architecture and related branches	39	48.8	3	3.8	0	-	21	26.2	17	21.2	80
Commercial Practice	3	13.6	7	31.8	0	-	2	9.1	10	45.5	22
Computer Engineering	30	33.3	4	4.4	4	4.4	31	34.4	21	23.3	90
CABM,CHM, and IT[4]	12	24.0	5	10.0	3	6.0	11	22.0	19	38.0	50
Electrical	18	25.0	10	13.9	5	6.9	24	33.3	15	20.8	72
Electronics and Applied Electronics	22	19.8	5	4.5	8	7.2	35	31.5	41	36.9	111
E& Cand other related branch[5]	10	16.7	4	6.7	3	5.0	24	40.0	19	31.7	60
Mechanical and Automobile	34	33.0	3	2.9	12	11.7	29	28.2	25	24.3	103
Others[6]	28	36.8	3	3.9	4	5.3	14	18.4	27	35.5	76
Total	196	29.5	44	6.6	39	5.9	191	28.8	194	29.2	664

Source: Field Survey

[4] CABM Computer Application and Business Management, CHM: Computer Hardware Maintenance, IT: Information Technology

[5] E and C and related: Electronics and Communication, Electronics and Avionics, Electronics and Instrumentation, Electronics and Production Technology, etc

[6] Others include Bio Medical, Chemical, Instrument Technology, Medical Electronics, Polymer Technology, Printing Technology, Telecommunication Technology, Textile Technology, Tool and Die making and Wood Technology

The 27 branches of study at the diploma level in Engineering are rearranged into 9 branches where the related branches are clubbed to form a core group and the rest with independent identity having no relation with any other branches are considered as Others.

A close look at the figures presented in the table reveals that the incidence of unemployment is again a fact among the diploma holders. This is substantiated by the relative distribution of the students across various occupations or forms of engagement in all branches of study. A comparison of the primary and the secondary data substantiates that the problem of unemployment among the diploma engineers is chronic. The distribution of the engineers on various activities is stable between the primary and secondary data with the only exception that engineers on apprenticeship are relatively more than on higher studies in the secondary data but the findings are opposite in primary data.

The table 3.6 in the data reveals the activity status of the diploma engineers in Kerala of 2009 across various branches of their study. Among the diploma engineers it is observed that of the 664 number of students chosen as sample, 196 numbers of students are on paid job and none are seeking self employment.The number of engineers who are unemployed is 194 implying that 29.2 percent of diploma engineers are unemployed. Hence it is adequate to state that the problem of unemployment among diploma engineers is of high intensity. The number of engineers pursuing higher studies is 191 which is also highly relevant as it is able to narrow the difference between the employed and the unemployed. The engineers go for higher studies either for career improvements or to escape from the state of being unemployed.

The table presents the following facts:

The branch-wise analysis shows the activity status is unevenly distributed with some branches exhibiting large scale employment absorption and others with high incidence of unemployment. The rate of employment is high in the branch of civil also considered as the traditional branches which is facilitated by a spurt in the growth of the construction sector. A large number of infrastructural investment by the government and also the demand for the housing have resulted in the generation of new employment opportunities for civil engineers and architects.

The engineers like and dislike for pursuing higher studies is determined to a large extent by the prospective employment opportunities waiting ahead and also is influenced by the chance of getting admission for higher studies in the present condition. The high intake capacity owing to new engineering colleges started and offering B.Tech. courses has attracted many of the diploma engineers to pursue higher studies. This argument holds true considering the fact that large number of engineers is in the branch of electronics and communication who joined for higher studies simply because of lack of the job opportunities and also because the seats for this branch in B.Tech. course is high.

The engineers seek employment in various sectors and the economic conditions affecting the role of each sectors will determine the real beneficiaries and victims. With economic liberalisation the government and public sectors introduced the policy of retrenchment of work force, as austerity measures. This rendered many of the engineers unemployed and the most affected are the engineers in the branch of commercial practice since their employment destination largely rests on the public and government sectors.

The total branch-wise activity status in detail is provided in the Appendix II Table 3.1 and 3.2

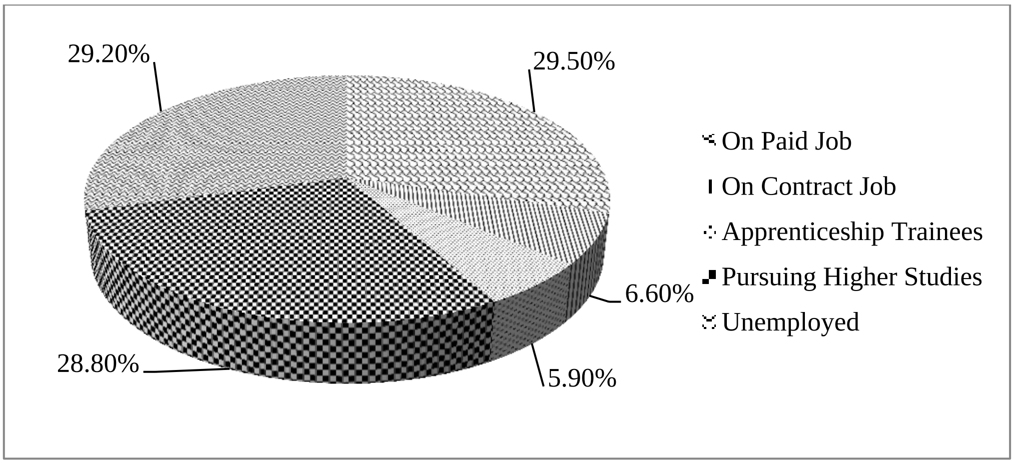

Figure 3.1 Activity Profile of the Diploma Engineers (in %)

Figure 1 shows the distribution of diploma engineers on various employment activities. The figure shows that the difference in the relative share of each activity identified as on paid job, those pursuing higher studies and of unemployed is marginal whereas the students on contract job and on apprenticeship training is small in their relative strength.

Activity status: the profile of graduate engineers

The engineering graduates unlike the diploma engineers are found more on paid job but only a marginal number of students are still found as self employed. The other category of employment is either in the status of a contract job or apprenticeship trainee and all the rest are unemployed looking for employment. The status of the graduate engineers on the basis of the sample observations is recorded and its highlights are given in the figure 3.2.

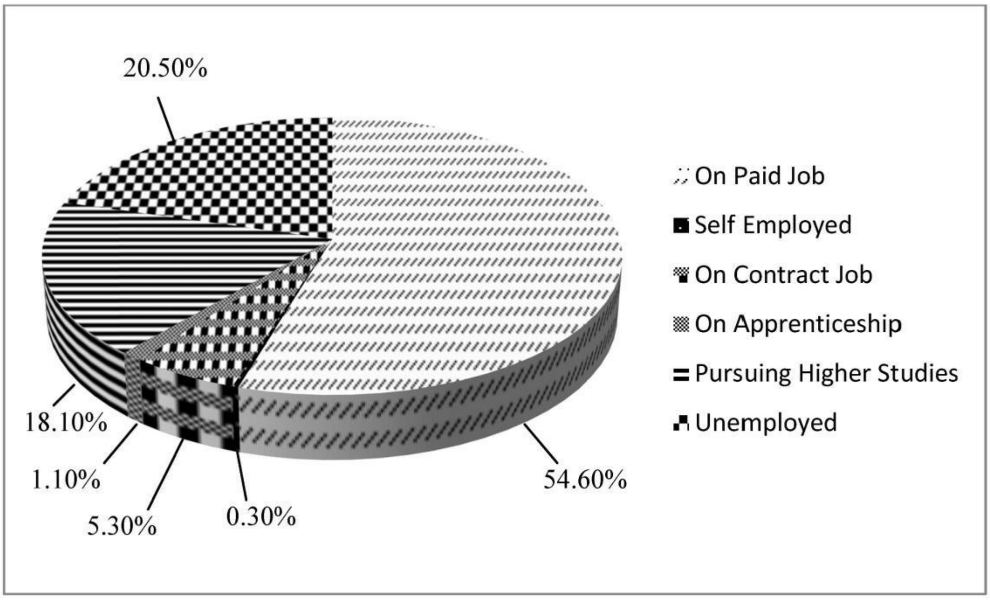

Figure 3.2 Activity Profile of Graduate Engineers (in %)

The Figure 3.2 for graduate engineers shows that the largest engagement of engineers is on paid job with an employment rate of 54.6 per cent. The figure also reveals that the graduate engineers are seeking self employment with 0.3 per cent and 5.3 per cent of engineers are on contract job. The engineers seeking apprenticeship are 1.1 per cent and 18.1 per cent of the engineers pursue higher studies. The unemployment rate among the graduate engineers is found to be around 20.50 per cent

The table 3.7 represents the data of the employment status for graduate engineers having completed B.Tech. courses in the year 2009 in 26 branches of study. The table shows that among 1237 number of engineers taken as samples, 676 numbers are on paid job with a marginal 4 number of engineers seeking self employment and the number of engineers engaged in contract job is 65. The number of engineers undergoing apprenticeship training is 14 whereas the number of engineers pursuing higher studies is 224.

Table 3.7 Activity Status of the Graduate Engineers in Kerala and Their Branch of Study

Branch	On Paid Job		Self Employed		On Contract Job		Apprenticeship/ Trainee Employee		Pursuing Higher Studies		Unemployed		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.
Civil and Architecture	53	57.6	1	1.1	3	3.3	2	2.2	13	14.1	20	21.7	92
Computer Science	127	54.7	0		7	3.0	0		39	16.8	59	25.4	232
Electrical and Electronics	105	52.0	1	0.5	22	10.9	8	4.0	33	16.3	33	16.3	202
Electronics and Communication	159	54.6	0		8	2.7	0		65	22.3	59	20.3	291
Information Technology	61	68.5	0		2	2.2	1	1.1	2	2.2	23	25.8	89
Mechanical	95	58.3	0		12	7.4	0		35	21.5	21	12.9	163
Others[7]	76	45.2	2	1.2	11	6.5	3	1.8	37	22.0	39	23.2	168
Total	676	54.6	4	0.3	65	5.3	14	1.1	224	18.1	254	20.5	1237

Source: Field survey

The table reveals the following facts:

The economic condition after liberalisation has been much influenced by the developments in Information Technology. Owing to some favourable factors, India’s comparative advantage in IT enabled it to emerge as IT superpower. The IT industry extends wide opportunities for engineers. Thus students in the branch of Information Technology are advantageously positioned in the labour market and hence they are more in paid job. The

[7] Others include Agriculture engineering, Applied Electronics and Instrumentation, Automobile, Bio Medical, Bio Technology, Chemical, Industrial, Instrumentation, Instrumentation and Control, Marine Engineering, Mechanical Automobile, Mechanical Production, Naval Architecture and Ship Building, Polymer Engineering, Polymer Science and Rubber Technology, Printing , Production Engineering, Safety and Fire Engineering

primary data analysis shows that the argument holds true empirically. The opening of European market was a further fillip to the booming IT industry. The evidence shows that IT comprising IT services, engineering services, R & D, software products and hardware has shown a compound annual growth rate of 30 per cent during the period 2004-08[8].

But since the IT industry also employs the engineers from other branches also, they enjoy the double advantage of engineering employment opportunities in their own branch and also in IT. Similarly their prospects of higher studies are also large with large intake capacity in M.Tech. course. The engineers in the branch of IT being left over with only a fewer other options as a substitute for employment, render them more in the form of being unemployed. This is particularly true among those engineers in IT who are in the lower strata in terms of their academic performance. Thus unemployment is also found more in the branch of IT.

3.6.2 Regional-wise Activity Status of Diploma and Graduate Engineers in Kerala

The regional distribution of the activity status of the diploma engineers and graduate engineers is shown to know any difference in the activities among the engineers classified on the basis of regions of their study. Southern Kerala consists of the districts of Thiruvananthapuram. Kollam, Pathanamthitta and Alappuzha while Central Kerala consists of Kottayam, Idukki, Ernakulam, Thrissur and Palakkad districts and Northern Kerala consists of Malappuram, Kozhikode, Wayanad, Kannur and Kasargod districts.

[8] NASSCOM Report. (2008).*India's Top Companies*.(www.dnb.co.in.TopIT_08overview.asp)

Table 3.8 Activity Status of the Diploma Engineers in Kerala across Regions

Region	On Paid Job		On Contract Job		Apprenticeship/ Trainee Employee		Pursuing Higher Studies		Unemployed		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Southern Kerala	44	22.4	15	7.7	11	5.6	58	29.6	68	34.7	196
Central Kerala	86	34.1	16	6.3	19	7.5	64	25.4	67	26.6	252
Northern Kerala	66	30.6	13	6.0	9	4.2	69	31.9	59	27.3	216
Total	196	29.5	44	6.6	39	5.9	191	28.8	194	29.2	664

Source: Field survey

The regional inequality existing in an economy in any forms is a bad repute to the economy. The features of employment among the diploma engineers do not reveal any such specific pattern or distribution. Thus if engineers on paid job is high in the central Kerala, on contract job it is high in the southern part of Kerala. Similarly unemployment is largely observed in the southern part which is characterised by low industrial development compared to other parts.

The difference in the activity status of the graduate engineers is shown in Table 3.9 and from it we read that-

Among the graduates, the engineers on paid job is high in the southern part largely facilitated by the concentration of engineering institutions in the south and also intake of academically good students. Thus large numbers of students on paid job are from the southern part of Kerala. Similarly this is also an advantage for those willing to pursue higher studies considering that academic achievements form the merit of selection for higher course. Thus large number of the students from the southern part is more in numbers pursuing higher studies. But the not so large differences in this characteristic signify that Kerala has succeeded to narrow the regional differences in terms of academic standards in engineering education also.

The contrasting observations of the spread of employment and unemployment between the diploma and graduate engineers in various regions are noticeable because of only a marginal difference between the various types of activities across regions.

Table 3.9 Activity Status of the Graduate Engineers in Kerala across Regions

Region	On Paid Job		Self Employment		On Contract Job		Apprenticeship/ Trainee Employee		Pursuing Higher Studies		Unemployed		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Southern Kerala	206	57.4	1	0.3	10	2.8	3	0.8	68	18.9	71	19.8	359
Central Kerala	346	54.4	3	0.5	38	6.0	9	1.4	116	18.2	124	19.5	636
Northern Kerala	124	51.2	0		17	7.0	2	0.8	40	16.5	59	24.4	242
Total	676	54.6	4	0.3	65	5.3	14	1.1	224	18.1	254	20.5	1237

Source: Field survey

3.6.3 The Gender Perspective of the Employment Status among the Diploma and Graduate Engineers

The engineering profession was gender biased in earlier times when conventionally it was believed that engineering education is favorable only to men with low women enrolment in this area of study. But as time passed, it is observed that women folks do not stay away from the engineering profession and instead there is an observable and significant entry of females into this profession with high enrolment ratio. The higher enrolment ratio however does not ensure that the labour market is unbiased in gender if viewed from the perspective of employment.

Table 3.10 Activity Status of the Male and Female Diploma Engineers in Kerala

Sex	On Paid Job		On Contract Job		Apprenticeship/ Trainee		Pursuing Higher Studies		Unemployed		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Male	137	32.8	21	5	31	7.4	130	31.1	99	23.7	418
Female	59	24.0	23	9.3	8	3.3	61	24.8	95	38.6	246
Total	196	29.5	44	6.6	39	5.9	191	28.2	194	29.2	664

Source: Field survey

The empirical data collected among the engineers and classified on the basis of their genderis shown in table 3.10 and 3.11 which reveals some facts regarding the gender based activity status of the engineers.

The preference for a particular type of gender among the employers will influence the activity status of the engineers. The larger the employment opportunities, the greater are the chance of being employed in the engineering profession. Other things being equal, employers in the private sector prefers to provide a job offer to males vis-à-vis females, with exceptions in some kind of job exclusively found suitable for women. Thus employment among the male engineers on paid job being greater than the females is found empirically true from the primary data belonging to both the diploma and graduate engineers.

The factors pushing the engineers for immediate employment are more among the male engineers. Therefore, they are large in numbers on contract job and apprenticeship than the female engineers.

Anticipating greater career prospects once they attain a graduate degree in B.Tech. the factors motivating for pursuing higher studies is high among the diploma engineers. This opportunity is also being largely used by the male diploma engineers. At the same time after the completion of B.Tech. the engineers pursue higher studies in M.Tech. course and those choosing these courses express their willingness to accept the occupation in Teaching also. Thus the female graduate engineers are more in numbers pursuing higher studies than the male engineers.

Table 3.11 Activity Status of the Male and Female Graduate Engineers in Kerala

Sex	On Paid Job		Self Employed		On Contract Job		Apprenticeship/ Trainee Employee		Pursuing Higher Studies		Unemployed		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Male	393	61.0	2	0.3	39	6.1	11	1.7	104	16.1	95	14.8	644
Female	283	47.7	2	0.3	26	4.4	3	0.5	120	20.2	159	26.8	593
Total	676	54.6	4	0.3	65	5.3	14	1.1	224	18.1	254	20.5	1237

Source: Field survey

The employment and unemployment figures among the diploma and graduate engineers' reveal that the preference for male employment either by the incumbent or by the employer being high renders more females to unemployment which is true both in the case of both the diploma and graduate engineers.

3.6.4 The Present Activity Status of the Diploma and Graduate Engineers: Their Social category

The social fabric of Kerala like other parts of the country is also characterized by the existence of various castes and sub castes belonging to different communities. The most popular classification of the Indian society is such that the society is divided into forward castes called the general category, and the other consists of the scheduled castes and scheduled tribes and other backward classes. However, the classification of the society on the basis of their educational backwardness is not explicitly observable in terms of the number of people enrolling for higher studies in Kerala, except for the scheduled tribes among whom enrolment is relatively low. But that in no way ensures that all the labourers are equally preferred in the job market irrespective of their caste credentials. It is therefore interesting to know the social conditions to which an individual is exposed and its effect on their employment profile.

The Table 3.12 and 3.13 reveals the activity status of diploma engineers and graduate engineers of Kerala across the various social categories to which the engineers belong.

Table 3.12 Activity Status of the Diploma Engineers among the Different Social Categories

Social Category	On Paid Job		On Contract Job		Apprenticeship/ Trainee Employee		Pursuing Higher Studies		Unemployed		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
General	50	25.6	6	3.1	12	6.2	75	38.5	52	26.7	195
Other Backward Class	135	32.6	33	8.0	19	4.6	100	24.2	127	30.7	414
SC & ST	11	20.0	5	9.1	8	14.5	16	29.1	15	27.3	55
Total	196	29.5	44	6.6	39	5.9	191	28.2	194	29.2	664

Source: Field survey

Table 3.13 Activity Status of the Graduate Engineers among the Different Social Categories

Social Category	On Paid Job		Self Employed		On Contract Job		Apprenticeship/ Trainee		Pursuing Higher Studies		Unemployed		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
General	367	58.8	3	0.5	20	3.2	7	1.1	127	20.4	100	16.0	624
Other Backward Class	281	51.3	1	0.2	38	6.9	6	1.1	83	15.1	139	25.4	548
SC & ST	28	43.1	0		7	10.8	1	1.5	14	21.5	15	23.1	65
Total	676	54.6	4	0.3	65	5.3	14	1.1	224	18.1	254	20.5	1237

Source: Field survey

The companies and other employers employing the engineers prefer to choose them based on merit unless and until they are compelled to dilute merit to satisfy other conditions. The larger and growing role of the private sector in India has led to a situation when merit is the most deciding factor of recruitment even if the measurement tools are different. Considering this as a fact the chance of being employed is higher among the engineers belonging to the general category as they are advantageously positioned due to some specific reasons, such as the quality of education received at the school level and their level of parental education. But this holds good in our analysis only in the case of graduate engineers. Among the diploma holders the engineers belonging to other backward classes are able to reap the benefit of employment on paid job but at the same time it is paradoxical to observe that their unemployment is also high.

As the engineers belonging to the scheduled castes and tribes are offered educational grants to pursue higher studies, large number of engineers prefer higher studies both in the case of the diploma and graduate engineering.

3.6.5 Analysis of the Employment Status of the Diploma and Graduate Engineers: Institutional Background

The engineering education in Kerala imparted through different types of institution are broadly classified as

1) Institutions owned and managed by the government or where they have a direct stake and control in its functioning and are directly administered by the competent authorities of the government,
2) Institutions owned, controlled and managed by the Universities,
3) Institutions owned and directly controlled and regulated under the supervision of Human Resource Development ,Govt of India,
4) Institutions managed and controlled by agencies that are owned by the state or central government but not directly funded by them such as LBS, etc.,
5) Institutions owned, controlled and managed by the private institutions but largely funded by the government through financial aid and supports called as the aided institutions,
6) Institutions that are directly owned, controlled and privately managed with no financial support from the government called as the private self financing institutions.

The institutions that are controlled and managed by the state governments, universities and central government and all other institutions where the government has a direct or indirect stake in one form or the other are treated as the government institutions, whereas the others in which the government has no stake in appointment but are only financially supported by the government are considered as aided institutions and the rest are considered as private self financing institutions

These three types of institutions exist in the diploma and degree level engineering institutions. In the initial stages of the development of technical institutions, the government institutions outnumbered the private institutions because the policy of government did not favour much private participation in order to have a complete control over the higher education, particularly in technical education. But with new policy reforms initiated during the post reform period a large number of private unaided institutions appeared in the field of technical education. The engineers who passed diploma engineering during the year 2009 are from 49 government colleges, 6 aided colleges and 3 private unaided colleges and those of engineering graduates are from 38 government colleges including university departments, 3 aided colleges and 53 private unaided colleges. The activity status of the diploma engineers, classified on institutional characteristics, is given below in table 3.14.

Table 3.14 Activity Status of the Diploma Engineers in Kerala across the Types of Institutions

Type of Institution	On Paid Job		On Contract Job		Apprenticeship / Trainee Employee		Pursuing Higher Studies		Unemployed		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Govt College	157	30.3	41	7.9	32	6.2	134	25.9	154	29.7	518
Pvt Aided College	28	23.9	2	1.7	7	6.0	48	41.0	32	27.4	117
Pvt Unaided College	11	37.9	1	3.4	0	-	9	31.0	8	27.6	29
Total	196	29.5	44	6.6	39	5.9	191	28.8	194	29.2	664

Source: Field survey

The enrolment of students in different type of institutions partially depends on the job placement records of these institutions. Those institutions which succeed in ensuring greater placements among the engineers will attract large number of students than the institutions which have performed badly in the campus placement. With higher competition existing in the engineering education due to large number of private players, the attempts to have an active campus placement cells is more in the private colleges. Thus engineers to some extent are attracted as a result of this. But the other factors like the infrastructural facilities available in the institutions, the quality of the faculty, etc. also determines the quality of the intake of the students.

On the other hand, there are only less number of government engineering institutions and also the intake capacity in these institutions is very low which offers courses at a subsidised low fee rates. These institutions have already established their repute over the years and as a result of these factors, large numbers of good students are attracted to these institutions. Thus the chance of being employed is greater among the engineers from government colleges and also private colleges where the above requirements are fulfilled. The empirical facts on the other hand prove contrary to the above proposition among the diploma engineers where employment on paid job is high among the engineers from private unaided colleges and the unemployment rate do not indicate much differences on the base of the type of institutions. Informal discussions with some of the faculty members working in diploma colleges are sceptical about the quality of intake in diploma colleges. In recent past the quality of intake in diploma has worsened due to large penetration of the B.Tech. colleges. As a result not so deserving students opt for a diploma which has seriously affected the quality of government colleges.

The engineers pursuing higher studies after the completion of the course is more among the private aided colleges at diploma level and at graduate level based on three tier classification.

But at the graduate level the engineers from the private aided colleges and government colleges are large in numbers on paid job and the unemployment rate is found high among the engineers who passed from private unaided colleges.

Table 3.15Activity Status of the Graduate Engineers in Kerala across the Type of Institutions

Type of Institution	On Paid Job		Self Employed		On Contract Job		Apprenticeship / Trainee Employee		Pursuing Higher Studies		Unemployed		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Govt college and IHRD	206	59.9	1	0.3	13	3.8	0	_	64	18.6	60	17.4	344
Universities	44	47.3	0	-	9	9.7	4	4.3	20	21.5	16	17.2	93
Private Aided College	74	62.2	0	-	6	5.0	3	2.5	22	18.5	14	11.8	119
GovtSelf financing Colleges	65	57.5	1	0.9	5	4.4	3	2.7	21	18.6	18	15.9	113
Private Unaided College	287	50.5	2	0.4	32	5.6	4	0.7	97	17.1	146	25.7	568
Total	676	54.6	4	0.3	65	5.3	14	1.1	224	18.1	254	20.5	1237

Source: Field survey

At graduate level the institutions are further classified into those that are managed by the Universities, those managed by the IHRD and also government self-financing colleges in order to know the difference in the activity of the engineers in institutions which are privately managed and which are not. Based on this classification, it is known that the engineers from the Universities are less in numbers on paid job mainly as their preference for higher studies is more revealed.

3.6.6 Activity Status of the Diploma and Graduate Engineers and Their Area of Residence

The engineers who passed diploma and graduate engineers come from both the rural and urban areas. The rural urban divide in India is more prominent due to it's unique characteristics of development. As the rural area in India is dominated by agricultural occupation, the facilities available for education are limited. This badly affects the academic standards of the students in rural areas and they fail to compete with their urban counterparts. As the level of education increases this discrimination widens.

Table 3.16 Activity Status of the Rural and Urban Diploma Engineers in Kerala

Area of Residence	On Paid Job		On Contract Job		Apprenticeship Trainee		Pursuing Higher Studies		Unemployed		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Rural	156	31.0	33	6.5	30	6.0	133	26.4	152	30.2	504
Urban	40	25.0	11	6.9	9	5.6	58	36.2	42	26.2	160
Total	196	29.5	44	6.6	39	5.9	191	28.2	194	29.2	664

Source: Field survey

Table 3.17 Activity Status of the Rural and Urban Graduate Engineers in Kerala

Area of Residence	On Paid Job		Self Employed		On Contract Job		Apprenticeship/ Trainee Employee		Pursuing Higher Studies		Unemployed		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
Rural	412	52.8	2	0.3	45	5.8	13	1.7	135	17.3	173	22.2	780
Urban	264	54.6	2	0.3	20	4.4	1	0.2	89	19.5	81	17.7	457
Total	676	54.6	4	0.3	65	5.3	14	1.1	224	18.1	254	20.5	1237

Source: Field survey

The rural urban difference in the activity status among the engineers is however not much prominent among the engineers in Kerala at the diploma level as the rural engineers are more on paid job and also they are unemployed in greater number vis-à-vis urban engineers. The empirical facts therefore disprove the fact that the urban population enjoy greater advantage in the job market in Kerala when analysed on the basis of the activity status of the diploma engineers. But at the same time the urban engineers reveal their preference for pursuing higher studies to improve the career prospects.

The activity status of the graduate engineers is more in consonance with the features as observed in rest of India. Hence large number of urban engineers is on paid job and their rate of unemployment is also low. The preference for higher studies is also revealed more by the urban engineers. Thus as the level of education increases the rural urban difference widens.

3.6.7 Activity Status of the Diploma and Graduate Engineers and Their Level of Parental Education

The level of education or years of schooling the parents have attended is expected to influence the major activities in which the engineers are engaged after passing their respective courses. With high level of the education of their parents, the engineers are better positioned to get tips and techniques which help them to get a better job offer than the students whose parents are not educated or having only low level of education.

The empirical facts however disagree with this argument in the case of diploma engineers as the engineers on paid job is not the least among those whose parents are less educated. But the unemployment among the engineers of less educated parents is found high which shows the partial effect of the level of parental education in determining the activity status of the diploma engineers.

Table 3.18 Activity Status of the Diploma Engineers and Their Level of Parental Education

Level of Parental Education*	On Paid Job		On Contract Job		Apprenticeship/ Trainee Employee		Pursuing Higher Studies		Unemployed		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Low Educated Parents	151	29.3	36	7.0	38	7.4	120	23.3	170	33.0	515
Educated	30	30.9	6	6.2	0	-	45	46.4	16	16.5	97
Highly Educated	15	28.8	2	3.8	1	1.9	26	50.0	8	15.4	52
Total	196	29.5	44	6.6	39	5.9	191	28.2	194	29.2	664

Source: Field survey

*Low educated parents – both parents non matriculate, Educated parents-at least one of the parent is above matriculate but below graduation, Highly Educated parents- at least one parent is above graduation or is professionally qualified

Table 3.19 Activity Status of the Graduate Engineers and Their Level of Parental Education

Level of Parental Education	On Paid Job		Self Employed		On Contract Job		Apprenticeship/ Trainee		Pursuing Higher Studies		Unemployed		Total
	No.	%	No	%	No.	%	No.	%	No.	%	No.	%	
Low level of Education	131	49.2	0	-	31	11.7	5	1.9	29	10.9	70	26.3	266
Educated	120	54.8	0	-	10	4.6	2	0.9	42	19.2	4	20.5	219
Highly Educated	425	56.5	4	0.5	24	3.2	7	0.9	153	20.3	139	18.5	752
Total	676	54.6	4	0.3	65	5.3	14	1.1	224	18.1	254	20.5	1237

Source: Field survey

But among the graduate engineers as the level of parental education increases the engineers on paid job also increases and also the unemployment among the engineers of highly educated parents is less. Similarly the large numbers of engineers who are pursuing higher studies belong to the category of highly educated parents. Thus the influence of the level of parental education in determining their activity status is according to the expectation and is empirically proved.

3.7 Activity Status of the Diploma and Graduate Engineers in Kerala: Inferential Analysis of Primary Data

The activity status of the diploma and graduate engineers as analyzed before gives the facts regarding the activities of the engineers after passing their courses which are classified on numerous parameters. But the descriptive facts are not necessarily statistically significant if the differences in the observation are merely a matter of chance due to sample errors or otherwise.

To examine whether the difference in the employment status among the diploma and graduate engineers is statistically significant, a chi square analysis is done and the summary of the findings is given in the Table 3.20.

Table 3.20 Inferential Analysis and Chi-square Results of the Employment Status of the Diploma and Graduate Engineers

Course of Study	Category	Chi-square Value	df	Sig.
Diploma	Branch	91.208	32	.000***
Graduate B.Tech.	Branch	90.549	30	.000***
Diploma	District	93.911	52	.000***
Graduate	District	83.666	65	.059*
Diploma	Region	12.633	8	.125
Graduate	Region	12.068	10	.281
Diploma	Gender	26.960	4	.000***
Graduate	Gender	40.306	5	.000***
Diploma	Social Category	27.835	8	.001***
Graduate	Social Category	34.956	10	.000***
Diploma	Type of Institution	17.728	8	.023**
Graduate	Type of Institution	23.118	10	.010***
Diploma	Area of Residence	6.240	2	.182
Graduate	Area of Residence	11.518	2	.042**
Diploma	Level of Parental Education	45.172	8	.000***
Graduate	Level Parental Education	48.891	10	.000***

*** significant at 1% level ,** significant at 5% level,*significant at 10% level

From the above table it is clear that the difference in the employment status is not significant both among the diploma and graduate engineers based on the region of the institution of their study but their difference is significant either at 1 per cent level or 5 per cent level or 10 per cent level if categorized on the basis of their branch of study, the district in which the institution is located, their gender characteristics, the social category, type of the management of institution, and the level of parental education. The area of residence of the engineers influences the activity status of the engineers only at the graduate level.

3.8 Findings and Conclusion

The present study therefore observes that the incidence of educated unemployment among the engineers has reached very high and serious proportion considering that it has crossed double digit figure and is now more than 20 per cent which needs immediate attention of the policy makers to find concrete solutions. The study highlights some of the major findings

The problem of unemployment among engineers is chronic both among the diploma holders and graduate engineers. This is because the national rate of unemployment as per the NSS 64th report [9] indicates the highest unemployment of only 8.1 per cent on daily status. The other rates of unemployment are much less than this daily status. The NSS report of the 68th round on employment and unemployment on the other hand shows that the maximum rate of unemployment among diploma holders is 8.1 per cent, whereas among the graduates it is 7.6 per cent[10].

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[9] *NSS Report 64th Round, Employment and Unemployment Situation inIndia.* Ministry of Statistics and Programme Implementation, Govt of India.

[10] *NSS Report 68th Round, Employment and Unemployment Situation inIndia.* Ministry of Statistics and Programme Implementation, Govt of India.

Similarly any unemployment rate greater than 10 per cent is considered high and unemployment rate greater than 20 per cent is considered very high[11]. Thus high unemployment rate of 29.2 per cent of diploma engineers and 20.5 per cent of unemployment rate among the graduate engineers is definitely high. In this context the problem of unemployment among the engineers in Kerala is therefore chronic and acute.

The activity status of the engineers classified on the basis of the traditional branches and the other non-traditional branches shows that the distribution of the employed engineers among the traditional and new branches is almost the same among both the diploma and graduate level. At the same time the incidence of unemployment is higher in the new branches than the traditional branches. Again the intensity of this problem is more serious at the diploma level.

The activity status of the engineers when compared among the diploma and graduate engineers shows that the engineers on paid job is high among the graduate engineers and therefore, reveals the preference for employment among them. This fact is further substantiated as the engineers joining for higher studies and also those remaining unemployed are low in the category of graduate engineers.

The activity status as observed both in the case of the diploma and graduate engineers reveals the least preference for self employment among the engineers even if the scope of self employment is high. The lack of entrepreneurial skill and also the inability to take risks is revealed here by the engineers.

[11] Ministry of Labour and Employment.(July 2010).*Annual Report to The People on Employment*

The branch of study of the engineers is also a factor that determines the activities where the engineers are engaged after passing their course. This is true both in the case of diploma and graduate engineers. Thus the likes and dislikes for an activity that emerge as an outcome of the branch of study will be a factor that influence the choice of the branch of the study in engineering in future.

The regional difference in the activity status among the engineers in Kerala is not much relevant because no significant difference in the activity status is observable both in the category of diploma and graduate engineers.

The other important factors that influence the activity status of the engineers is their gender characteristics, the social category to which the engineers belong, the type of the management of the institutions, the area of residence of the engineers and also the level of parental education. The strength of the influence of these factors on the activity status of the engineers based on the expectations is more among the graduate engineers than the diploma holders. Thus it is implied that as the level of education increases, the rate of discrimination also increases.

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Chapter 4

EMPLOYMENT PROFILE OF THE DIPLOMA AND GRADUATE ENGINEERS IN KERALA: PROBLEMS AND PROSPECTS

Contents

4.1 Introduction

The occupational choice of an individual to ensure a secure and stable life is essentially influenced by numerous factors. On the one hand occupational choice is determined by economic factors but in India from the very good old days it has its social dimensions owing to the presence of the principle of chaturvarna system. But the occupational choice of all individuals was not compatible with the skill and dexterity the person was endowed with.

The advent of British rule and adoption of new technology in the production process however, discarded the skill measurements based on the properties of inheritance and instead adopted new methods of measuring skills on the basis of the productive capacity of labour. To judge the factors having a direct bearing on the productive ability, education and training received by an individual are considered the best. Hence education and training are imparted to every labourer in the modern society for acquiring the skills necessary for an effective occupation capable of increasing the productivity of labour.

The dynamics of employment lies on the different professional skills acquired through education and training. But it is not necessary that an individual after being trained for a specific profession finds employment in the same field. This is because there is large scale incidence of market irregularities and individuals are forced to seek other prospective areas of employment for survival. This undermines the potential level of growth of an economy as labour is under- utilized.

The employment away from the respective field, however, requires greater attention as not only its cost is high for the individual but it also involves higher social cost. Therefore, professional education involving higher social cost is to be analysed on cost benefit principles. Here the benefit derived is measured on the scale of employment and the value of output generated, whereas the cost is the expenditure of imparting education and training necessary for the development of a profession including individual and social cost. Professional education involving higher social cost is to be examined in terms of the benefits derived by the society and the cost involved in training. Among the various professional education fields, the technical education particularly the engineering education holds greater significance due to its mammoth share in the quantum of expenditure.

The engineering education aims at building basic engineering skills essential for economic growth. In the initial stages of development in India there was a serious dearth of engineers. In an attempt to achieve self reliance, engineering education was expanded to accomplish adequate number of skilled engineering professionals. However continuing with the policy of unregulated expansion of engineering education resulted in labour market irregularities leading to redundancy and consequent unemployment and underemployment. The post liberalisation period witnessed unexpected transformation in educational policies with large private participation in higher levels of education and training surpassing the role of the government and its participation in education leading to a glut of some professionals.

In the field of engineering with multiple disciplines of study and each branch uniquely designed for specialisation it is essentially warranted that the particular professional finds employment in those areas where they are trained. But studies show that the engineers are diverting not only to other areas of specialisation but also to non engineering areas. For instance, the study on the unemployment rates and employment characteristics for engineers by the National Science Foundation for United States found that six per cent of the engineers are working in non engineering services[1]. The functions performed by these engineers are also such that they do not require engineering education for the services rendered. The observations made in this regard vary across various characteristics, vis-à-vis, the federal state where the student has

[1] James J Brown. (1972). Unemployment Rates and Employment Characteristics for Scientists and Engineers. *National Science Foundation, 72*(307).

received the education. Because of non uniform spread of the engineering education in India and larger concentration of such institutions in the southern parts of India its effect on employment is much greater than that is expected. There are other characteristics also that influence the employment prospects of engineers, namely the branch of study, the gender characteristics, the social profile, the level of parental education, the area of residence, the type of institution of study, etc. to which the students are inclined. Thus the employment profile of the engineers being largely dynamic in character, a researcher tries to trace out those factors that particularly influence or strengthen the employment profile of the engineers and the extent to which this variation is observably significant.

The employment profile of the engineers, therefore, is an attempt to throw light on the various dimensions of the post employment phenomenon of the engineers employed on regular paid job, on contract job, on apprenticeship trainee and self employed engineers on the basis of

- their area of employment
- the functions rendered in their present capacity on employment
- the sector of employment
- the various means of getting employment
- the level of job satisfaction attained from employment
- the level of income satisfaction attained from employment

The profile of employment varies across the characteristics based on the basis of their branch of study, their gender feature, the type of institution of study, the social category to which they belong, the region of the location of the institution, their level of parental education, their area of residence, etc. The difference in employment profile is mainly examined to determine the virtue of those characteristics that strengthen and badly weakens the employment potential of engineering profession also.

4.2 Employment Area of the Engineers in Kerala, Their Diversification: Issues and Challenges

An employee rendering his/her service in any capacity during his/her employment period is identified on the basis of their area of employment. But any movement of the labour away from their specialization for seeking job is considered as diversification.

The incidence of diversion of a professional to other areas in search of employment is considered as a taint to the worthiness of the profession because of its failure in engaging the professionals in their respective areas of specialisation. The engineering education is the worst example of this phenomenon. The high magnitude of the imbalance between the demand and supply of engineering manpower in their respective areas of specialisation observable in some parts of the country and in other parts of the world has resulted in the problem of unemployment among these engineers. As a result of this unemployment there is a manifestation of a higher degree of drift in the area of employment both among the diploma and graduate engineers and it is a matter of concern among the policy makers. This diversion in the area of employment among engineers is also to be considered as a kind of unemployment or underemployment as they are not employed in consonance with the already acquired skills and training. The problem assumes wider dimension if diversion for employment is classified on the basis of the characteristics of their branch of study, their gender, social category, etc. To what extent this difference is genuine and applicable while examining the case of employment characteristics of the engineers in Kerala is to be analysed for understanding the real problem.

4.2.1 Area of Employment among the Engineers in Kerala: Descriptive Analysis of the Primary Data

The area of employment shows the area in which the employed engineers are employed in rendering their services. In economic parlance, however, diversion is considered as a merit because it enables and facilitates mobility. The diversion to other areas is an index of the degree of mobility adding to the merits of an economy because it results in the generation of new employment opportunities. But diversion of engineers for employment to other areas is not welcome if such diversions are forced as it impairs the realisation of potential output.

The other perspective is that the diverting synchronism identified as the shifting of trained engineers from the manufacturing and core engineering sectors to computer and IT or any other field in the tertiary sector also means overdependence of the professionals on such sectors, which are not fully insulated from the precarious market conditions (Sabu Thomas , Shelly M K, 2009)[2]. Hence with the incidence of downturn of demand for the professionals observed in the IT sector, say during the recession of 2009, the employment prospects and the working conditions of the engineers were adversely affected, leading to greater distress among the working employees and also the forthcoming aspirants.

[2] Sabu Thomas, Shelly M K. (2009, October-December). Engineering Labour Market: Employment Scenario of the Fresh Engineers in Pre and Post Economic Recession Period- An Analysis of Kerala. *Productivity, 50*(3), 226-233.

The imposed diversion undermining the demand for labour as a result of economic conditions also shows that the engineers do not find good employment opportunities in their particular area of specialisation leading to wide difference in employment absorption across the various branches of study. This dynamism of the market with respect to the employment absorption among the various branches of study results in the preference for a particular branch during a period which is only transitory as changes in the market conditions unduly affect the labour market again in future.

The diversion to other areas for employment among both the diploma and graduate engineers is analysed across various branches of study to identify those branches where diversion is high and where it is least owing to the difference in the availability of employment opportunities during the period of analysis. If the diversion is observably significant in the engineering education among both the diploma holders and graduate engineers then it is a matter of concern for policy makers due to its economic and social relevance. This is because the labour market conditions also produce a signalling effect necessarily demanding controls and checks in engineering education according to requirement such that they do not aggravate the problem of existing unemployment. Similarly from an economic perspective it is necessary to ensure that the actual output and potential output are the same which is possible only when labour gets absorbed in the market according to their skill and training acquired.

4.2.1.1 Area of Employment of the Engineers in Kerala and the Branch of Study

The area of employment of the diploma engineers in Kerala: The data of the diploma engineers signifies that among the branches characterized on the basis of their specialization, significant numbers of them do not employ the qualified diploma engineers in their respective area of study because 12.9 per cent of the diploma engineers are diverting to other areas for employment different from their area of study. (See Appendix IV Table No: 4.1)

Among the diploma engineers the branches when analysed in groups however, shows that the branch of Electrical has succeeded in employing the students in their own area of study.

Table 4.1 Employment Area of the Diploma Engineers among Different Branches of Study

Branch of study	Employed in the same area of study		Employed in other areas		Total
	No.	%	No.	%	
Civil, Architecture and related branches	39	92.9	3	7.1	42
Commercial Practice	9	90.0	1	10.0	10
Computer Engineering	29	76.3	9	23.7	38
CABM,CHM, and I T	14	70.0	6	30.0	20
Electrical	33	100.0	0	-	33
Electronics and Applied Electronics	29	82.9	6	17.1	35
E&C and other related branch	13	76.5	4	23.5	17
Mechanical	34	87.2	5	12.8	39
Others	43	95.6	2	4.4	45
Total	243	87.1	36	12.9	279

Source: Field survey

The area of employment of the graduate engineers in Kerala: The graduate engineers are classified into seven groups with six branches identified as conventional due to their presence or popularity right from the beginning of the engineering courses in Kerala. The remaining branches are clubbed to form others having strength both in absolute and relative numbers.

The data for graduate engineers shows that in total 30.7 per cent of the graduate engineers are employed in the area different from their area of study (See Appendix IV Table 4.2).

If the branches are combined together to form a group it is observed that the branch of Mechanical employs relatively the maximum number of students in their respective area of study with 88.8 per cent of students employed in same area of their study in engineering whereas the largest diversion among the engineers to other areas is in the branch of Electronics and Communication where 65.3 per cent of engineers have diverted to other areas for employment.

Table 4.2 Employment Area of the Graduate Engineers among Different Branches of Study

Branch of study	Employed in the same area of study		Employed in other areas		Total
	No.	%	No.	%	
Civil and Architecture	51	86.4	8	13.6	59
Computer Science	116	86.6	18	13.4	134
Electrical and Electronics	93	68.4	43	31.6	136
Electronics and Communication	58	34.7	109	65.3	167
Information Technology	51	79.7	13	20.3	64
Mechanical	95	88.8	12	11.2	107
Others	62	67.4	30	32.6	92
Total	526	69.3	233	30.7	759

Source: Field survey

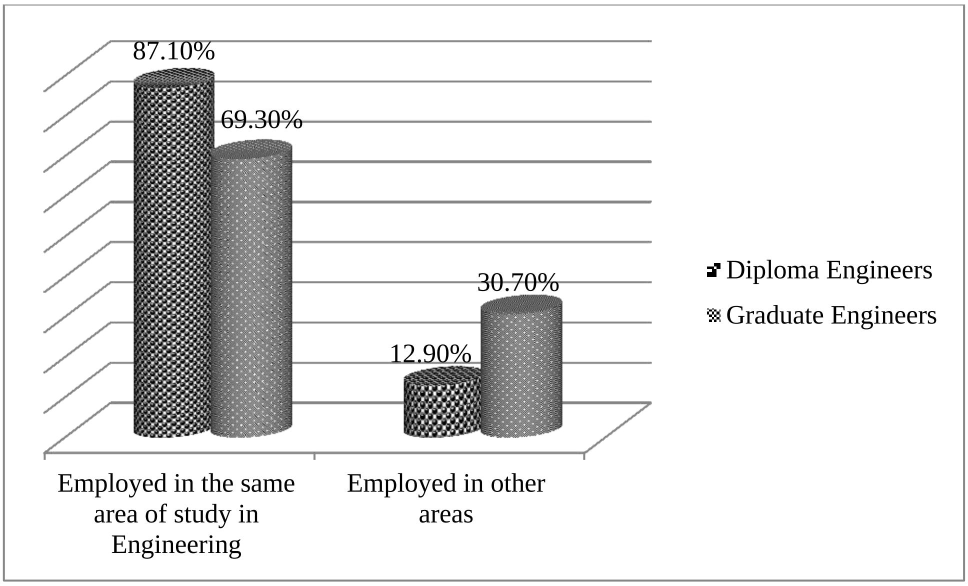

Figure 4.1 Area of Employment of the Diploma and Graduate Engineers

Among the diploma engineers diversion is found high in computer related branches because they do not have as many opening as that is available to the graduate computer engineers, particularly in the area of software development. The larger diversion of graduate engineers in the branch of electronics and communication is mainly because of their employment in the software and their diversion is further intensified due to the non-availability of job in the core area of electronics with low growth profile of the electronics industry compared to other sectors in Kerala and also in India.

4.2.1.2 Area of Employment and the Gender Characteristics of the Engineers in Kerala

The difference in the area of employment classified on the basis of their gender holds importance because of the prevalence of widespread discrimination against women in the employment, the nature of work they are engaged in, their work place, etc. In India, with traditional patriarchal domination, the women were kept away from the work as the male was assumed to be the prime bread winner of the family. The women were forced to be in the status of unpaid family worker with household chores. A gradual departure from this practice in the beginning was observed when women entered the labour force in the form of casual labour in order to supplement the family income, thereby supporting the family in meeting its economic ends, particularly among the economically backward classes. Later on with the promotion of mass education across all gender types, education of the women at the primary level was quite evident in India but professional education witnessed this trend only recently and that too in some limited pockets spread across various parts of the country.

In Kerala however, women did enter the professional streams of education with high enrolment above the national average at all levels of education, including the engineering education. The number of women engineers in Kerala is the highest among the southern states (Parikh, 2004)[3]. However, in the post employment situation in the professional education it is not assured that the women are fully employed in their respective area and like men they are also confronting lack of job opportunities in their area of study.

The employment area of male and female engineers among both the diploma and graduate engineers shows that the diversion to other areas for employment is prevalent more among the female engineers as compared to the male engineers.

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[3] Parikh P P and S P Sukhatme. (2004, January). Women Engineers in India. *Economic and Political Weekly, 39*(2), 193-201.

Table 4.3 Gender Characteristics and Diversion to Other Areas for Employment among the Diploma and Graduate Engineers

Course and Gender	Employed in the same area of study		Employed in other areas		Total
	No.	%	No.	%	
Diploma Engineers					
Male	174	92.1	15	7.9	189
Female	69	76.7	21	23.3	90
Graduate Engineers					
Male	335	75.3	110	24.7	445
Female	191	60.8	123	39.2	314
Total	769	74.0	269	26.0	1038

Source: Field Survey

The table 4.3 shows that diversion for employment to other areas is more evident among the female engineers.

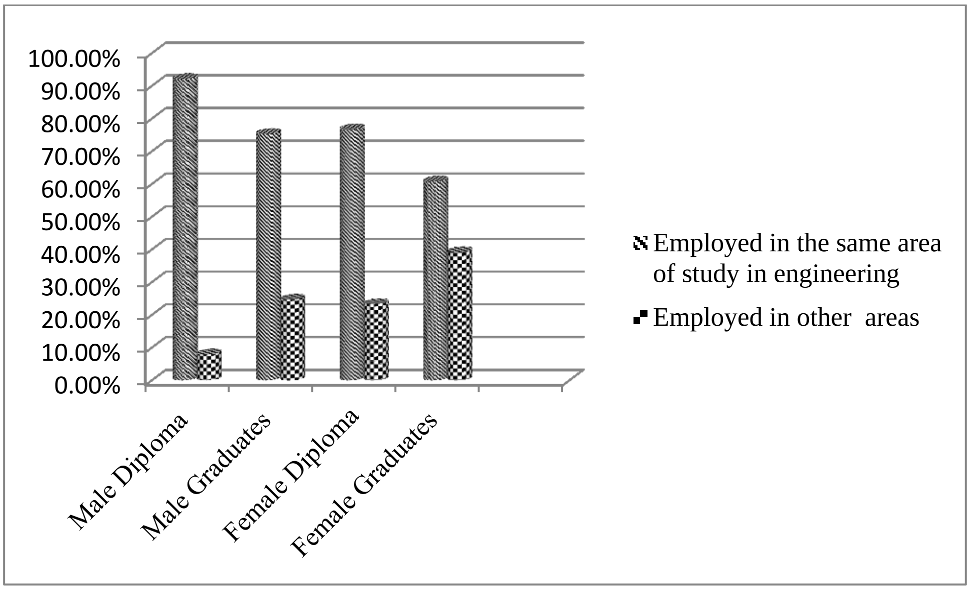

Figure 4.2 Employment Area of the Male, Female Diploma and Graduate Engineers

The majority of the male engineers have greater mobility and therefore, geographical boundaries are not at all a constraint for employment among them. Therefore, the male engineers can take up employment according to the interest in their own area of study by overcoming larger constraints. But among the females, the choice of employment is limited as it is more of a convenient nature forcing them to divert to other areas from their study as the employment obtained is convenient and comfortable.

4.2.1.3 Area of Employment and the Social Category of the Engineers in Kerala

The social categorization of the engineers based on their caste is significant in the present context because of the incidence of wide differences among the individuals based on caste observed in various social and economic contexts. The development features in India are such that it signifies a wider exclusion of the socially and economically underprivileged members of the society from the domains of development.

In Kerala, unlike the rest of India, discrimination based on social category is not evident due to the prevalence of social equality achieved and there is a high enrolment of students even among the backward classes at the higher education level. But it does not necessarily ensure that the backward communities have a good employment profile in the labour market. The employment profile of the engineers tested on the basis of their social category reveals the extent to which students are discriminated against in terms of caste in the post employment conditions. Similarly social equality does not necessarily mean that there is an economic equality and economic compulsions may force diversion of employment to other areas. Therefore, the diversion to other areas for employment based on caste is evaluated in order to know the extent of social factors in determining the employment profile of the passed diploma and graduate engineers.

Table 4.4 Diversion to Other Areas for Employment among the Engineers and Their Social Category

Social Category	Employed in the same area of study		Employed in other areas		Total
	No.	%	No.	%	
Diploma engineers					
General Category	63	92.6	5	7.4	68
Other Backward Class	160	85.6	27	14.4	187
SC and ST	20	83.3	4	16.7	24
Graduate engineers					
General Category	271	68.3	126	31.7	397
Other Backward Class	228	69.9	98	30.1	326
SC and ST	27	75.0	9	25.0	36
Total	769	74.0	269	26.0	1038

Source: Field survey

Among the employed diploma engineers it is found that more of the engineers belonging to SC and ST are diverting to other areas but among the graduate engineers the diversion is the highest in the general category.

If we make a comparison between the diploma and graduate engineers with respect to the diversion in employment, it is found that relatively more of the graduate engineers are diverting to other areas for employment than the diploma engineers.

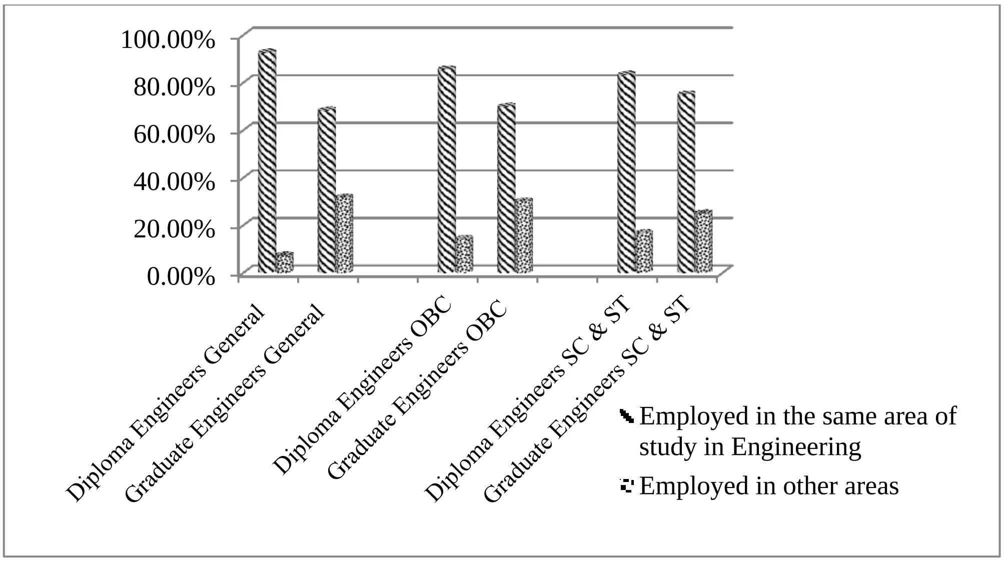

Figure 4.3 Area of Employment of the Engineers and Their Social Category

With liberalization, the role of the government and public sector has declined in terms of the number of recruitment. As a result many of the job seekers fail to get absorbed in their respective area of study and the most affected are the individuals belonging to the backward community. The outturn of this engineers being large in number leads to their diversion which is more evident among the diploma engineers. At the same time the larger scope of employment in the software and information technology with undue preference among the employers for engineers belonging to the forward community has resulted in larger diversion among the general category engineers. A study conducted for identifying the determinants of job offer among the graduate engineers observed that the companies coming for recruitment to different institutions in Delhi do not provide reservation to the students belonging to Scheduled Castes, Tribes and those belonging to Other Backward Classes. Hence it is argued that the engineering students belonging to general categories have a high propensity to get a job offer upon their graduation than the students belonging to reserved categories [4]. It is also found that the largest recruiters from engineering colleges are the IT firms.

4.2.2 Area of Employment and Diversification among the Engineers in Kerala: Inferential Analysis of Primary Data

The area of diversification for employment among the diploma and graduate engineers implies that the engineers in total fail to find employment in their own area of study and this diversification is different across various characteristics and its summary is given in the table 4.5.

Table 4.5 Area of Diversification for Employment among the Engineers in Kerala: Inferential Statistics of Primary Data

Course of Study	Characteristics	Category	Chi-square Value	df	Sig.
Diploma	Area of Employment	Branch	20.469	8	.009***
Graduate B. Tech	Area of Employment	Branch	143.289	6	.000***
Diploma	Area of Employment	Gender	12.861	1	.000***
Graduate	Area of Employment	Gender	18.076	1	.000***
Diploma	Area of Employment	Social Category	2.559	2	.278
Graduate	Area of Employment	Social Category	.813	2	.666

Source: Data computed

The inferential table shows that the diversification for employment is statistically significant with respect to the branch of study and gender among both the diploma and graduate engineers but it is not statistically significant with respect to their social characteristics.

[4] Choudhary, P. K. (2009). Technical Education and Labour Market: An Empirical Study of Engineering Graduates in Delhi. In C. P. Kumar, *An Economic Analysis of Demand for Higher Education in India: A Study of Engineering Education in Delhi.* Ph. D Thesis NEUPA.

4.2.3 Reasons of Diversion for Employment to Other Areas among the Engineers in Kerala

Diversification for employment from one area to another is an observable feature both in the organized and unorganized sector, but the motives are different. Diversification from one sector to other is motivated by factors such as low remuneration from last job, place of work away from home, health related and family related factors, work place closed down, etc. The engineers who are largely employed in the organized sector have higher factor mobility but divert to other areas because of entirely different reasons from that observed in the unorganized sectors. The significant number of diversion to other areas for employment among the diploma and graduate engineers also requires an adequate explanation for the factors responsible.

The perspective of diversion to other areas for employment varies across the employer, the experts and the employee. The employers recruit employees from different areas considering their productive capacity particularly when it is higher than that of the cost and if found fit for rendering the particular job in the organization. The expert opinion on the other hand is guided by the principle of the cost benefit analysis from a macro perspective of the whole economy. The cost here also includes the social cost evaluating the merits and demerits of diversions. But among all, it is the employee's opinion that holds relevance because the ultimate casualty of any post-employment benefits and liabilities is ultimately borne by the employee only. The passed engineers will, therefore, explain the exact reason for diversion to other areas for employment in the present context.

According to the feedback obtained, the students working in other areas have stated different reasons for diversion, such as no job offer in the area of study, higher remuneration in the diverted area of employment, other attractions of the job and other unexplained reasons. Of all the reasons for diversion, no job offer in their respective area of study is the prominent reason expressed by the engineers for diversion to other areas as waiting for a long period for employment in their respective areas is unaffordable due to various pull and push factors. The early employment of the peer groups during their studies pressurizes the engineers to join employment. Similarly the worries of the engineers increase if there is belated absorption in the labour market. The other important push factor is the social compulsion imposed due to undue attachments and recognition given to the status of being employed by the family members and society as a whole. Hence a long waiting period nullifies the preference for employment in their respective branch of study or area of study.

Another important reason for diversion, is the higher remuneration offered in other areas of study. It holds significance because the students are very much motivated by the piece of monetary cakes rather than immaterial satisfaction from jobs. This phenomenon in the engineering labour market is observed in the case of both the diploma and graduate engineers even if the degree of influence of these factors differs between the diploma and the graduates.

The feedback obtained from engineers stating their reason for diversion among the diploma and graduate engineers is shown in the table 4.6.

Table 4.6 Reasons of Diversion among the Diploma and Graduate Engineers in Kerala

Course of Study	Reason for Diversion								Total
	No Job Offer in the area of study		High remuneration in the present job		Non monetary attractions of the job		Other reasons		
	No.	%	No.	%	No.	%	No.	%	
Diploma	27	75	Nil	-	5	13.9	4	11.1	36
Graduate	122	52.4	6	2.6	105	45.1	Nil	-	233
Total	149	55.4	6	2.2	110	40.9	4	1.5	269

Source: Field survey

4.2.3.1 Reasons of Diversion for Employment among the Male and Female Engineers

Among both the diploma and graduate engineers the table 4.3 shows that diversion to other areas for employment is higher among the female engineers than among the male engineers. The factors that have prompted women for employment to other areas might be different from those of men because the very motive of employment among women is different from that of men.

The stream of engineering education when classified into diploma and graduate levels also depicts a unique phenomenon because of the differences in the gender characteristics observed between the male and females and also within the particular sex. Among the female engineers there are differences in their area of residence, the type of schooling undergone, the medium of instruction received in schooling and the level of parental education which are likely to influence the employment condition of engineers[5]. Because of some favourable factors, graduate engineers are advantageously placed as compared

[5] Ibid

to the diploma engineers leading to a wider imbalance among the various categories of engineers classified on the basis of this education.

Table 4.7 Reasons of Diversion among the Male and Female Diploma and Graduate Engineers in Kerala

Course of Study& Gender	Reason for Diversion								Total
	No Job Offer in the area of study		High remuneration in the present job		Non monetary attractions of the job		Other reasons		
	No.	%	No.	%	No.	%	No.	%	
Diploma									
Male	10	66.7	Nil		5	33.3	Nil	-	15
Female	17	81.0	Nil		Nil	-	4	19	21
Graduate									
Male	48	43.6	3	2.7	59	53.6	-	-	110
Female	74	60.2	3	2.6	46	45.1	-	-	123
Total	149	55.4	6	2.2	110	40.9	4	1.5	269

Source: Field survey

The diploma engineers and graduate engineers characterized according to their gender composition and their diversion to other areas for employment reveal that 81.0 per cent of female diploma engineers and 60.2 per cent of the female graduate engineers are diverting to other areas only because of no job offer. On the other hand only 66.7 per cent of male diploma engineers and 43.6 per cent of the graduate male engineers are diverting to other areas because of no job offer in their respective area of study.

Thus both among the diploma and graduate engineers more of female engineers compared to male engineers are diverting to other areas for employment owing to no job offer in their area of study.

4.2.3.2 Reasons of Diversion for Employment among the Engineers and Their Social Category

The existence of various social groups in India is a unique characteristic with diversified social and economic conditions. Hence unemployment of larger duration forces the engineers to accept employment at the earliest without considering of the area of employment.

Table 4.8 Reasons of Diversion for Employment among the Diploma and Graduate Engineers in Kerala and Their Social Category

Course of Study & Social Category	Reason for Diversion								Total
	No Job Offer in the area of study		High remuneration in the present job		Non monetary attractions of the job		Other reasons		
	No.	%	No.	%	No.	%	No.	%	
Diploma									
General	5	100	Nil	-	0	-	0	-	5
OBC	20	74.1	Nil	-	3	11.1	4	14.8	27
SC & ST	2	50.0	Nil	-	2	50.0	0	-	4
Graduate									
General	54	42.9	5	4.0	67	53.2	Nil	-	126
OBC	60	61.2	1	1.0	37	37.8	Nil	-	98
SC & ST	8	88.9	0	-	1	11.1	Nil	-	9
Total	149	55.4	6	2.2	110	40.9	4	1.5	269

Source: Field survey

The reason for diversion among the diploma and graduate engineers across the various social groups is examined here.

The reason for diversion shows that all of the General category diploma holders have diverted to other areas only because of no job offer in their respective area of study. For the graduate engineers, it is found that 88.9 per cent of SC and ST students have diverted to other areas because of no job offer in their respective area of study that is largest among the graduates.

4.3 Employment Functions of the Diploma and Graduate Engineers in Kerala

The employment function is closely associated with the occupation of a person. The occupational classification based on the sector of employment, into the primary sector, secondary sector and tertiary sector is an indication of the structure of employment but the employment function explains in detail the function rendered by an employee in their capacity.

An engineering student after completing their respective courses is employed in various sectors, performing various functions that is capable enough to provide means of livelihood to them. Some of the functions rendered by them require an engineering aptitude but there are other functions also that do not require any engineering skill. Thus by merely stating a student as employed does not mean he is potentially employed according to the capacity of the skills acquired through education. The function performed by these engineers even on employment is discussed among both the diploma and graduate engineers.

The engineering professionals are employed as teachers or are working in the manufacturing sector or are otherwise working as even clerks. How far these professionals had been able to utilize their skills while employed is a matter of interest because the ability to earn as a professional depends on the functions performed by these engineers in their working capacity.

The employment function rendered by the passed engineering students is obtained from the feedback received and the engineers are found working as Teachers, engaged in production or operation activities, or are working in the sales and services, maintenance and repairs, administration and management, research and development, software and hardware, clerical or office work, and design and planning. These functions are then consolidated on the basis of the employment characteristics and then are broadly classified into Teaching, Engineering related services, Administration or Management, Software, Clerical or Office work. The engineering service here includes production, operation, sales and service, maintenance and repair, research and development, design and planning.

4.3.1 Employment Function of the Diploma and Graduate Engineers: Secondary Data Analysis

The employment function of the diploma and graduate engineers are examined based on the data for various years obtained from the NTMIS reports of Kerala to know the functions rendered by the engineers in the capacity of being employed.

Table 4.9 Employment Function of the Diploma Engineers (1986-2008) (in %)

Year	Teaching	Engineering	Administration/ Management	Software	Clerical and Office work
1986	0.85	48.34	37.24	N A	9.65
1987	0.75	41.5	38.1	N A	8.8
1988	13.1	72.1	2.3	N A	6.2
1989	10.4	72.3	4.9	N A	6.3
1993	13.5	75	3.4	N A	3.5
1997	11.1	70.6	3.3	N A	6.7
1999	9.1	48.9	4.2	N A	5.1
2000	13.9	70.4	3.4	3.1	1.9
2001	18.2	65.5	2.7	2.9	3.4
2002	18.5	63.1	3.3	2.1	3.1
2003	18.9	62.2	2.2	2.6	3
2004	16.4	60.9	3.9	2	3.1
2005	16.4	60.9	3.9	2	3.1
2006	15.6	65	4.5	2.2	3.8
2007	13.6	65	3.3	3	4.5
2008	9.83	72.75	1.98	13.78	1.64
Average	12.51	63.41	7.66	2.11	4.61

Source: Data compiled from NTMIS Reports (1986-2008), NA-Data not available

Employment function of the Diploma Engineers: Secondary Data Observations

The average employment function of the diploma engineers during the period 1986 to 2008 shows that the majority of the engineers are in engineering related services. The teaching profession is the next important destination of engineers. Next to teaching the engineers are in administration and management which is followed by the clerical or office work. The last destination of the functions rendered by the diploma engineers is in software as per the average figures. But it is to be noticed that even if there are some variations between the years, still engineering is the most prominent function of the diploma engineers.

Employment function of the Graduate Engineers: Secondary Data Observations

The employment function of the graduate as obtained from the NTMIS reports for the various years shows that engineering is the highest destination of their employment, but its value is much less than what is observed among the diploma engineers. Similarly unlike the diploma engineers, software is the next important destination of employment and its relative share is very high and significant considering the fact that large number of engineers would have remained unemployed in the absence of software as an avenue of employment. Next to software, teaching holds an important choice of employment among the graduate engineers which is followed by administration and management. The least performed function among the graduate engineers is the clerical or office work.

Table 4.10 Employment Function of the Graduate Engineers (1986-2008) (in %)

Year	Teaching	Engineering	Administration/ Management	Software	Clerical and Office work
1986	0.42	49.20	36.36	NA	5.03
1987	4.80	57.20	19.00	NA	4.80
1988	15.90	67.30	4.60	NA	1.70
1989	12.10	70.60	6.60	NA	2.40
1993	11.80	69.90	7.00	NA	3.70
1997	11.20	67.70	2.90	NA	6.20
1999	9.70	66.70	5.40	NA	7.10
2000	7.20	50.40	5.60	25.40	8.80
2001	25.20	31.80	3.10	35.20	0.70
2002	10.60	39.00	1.70	25.80	17.80
2003	8.60	33.00	3.50	48.50	2.50
2004	15.57	32.87	2.98	45.03	1.98
2005	15.57	32.87	2.98	45.03	1.98
2006	18.80	30.60	4.80	38.30	2.70
2007	14.30	32.30	2.70	44.70	2.50
2008	11.71	25.45	1.14	51.80	9.87
Average	12.09	47.31	6.90	39.97	4.99

Source: Data compiled from NTMIS Reports (1983-2008), NA: Not Available

4.3.2 Employment Function of the Diploma and Graduate Engineers: Inferential Analysis of the Secondary Data

The employment function of the diploma and graduate engineers and the changes in their function between the two periods, one before the year 2001 and the other since the year 2001 is examined in order to know the influence of the developments in the engineering education in determining their employment function particularly when the opening of self financing colleges was started after 2001 in engineering.

Table 4.11 Employment Function of the Engineers in Kerala During the Pre and Post 2001 Period: 't' test Results

Course of Study	Employment Function	Mean Values in %		Mean Difference	t Value	Sig (2- tailed)
		Pre 2001 years	Post 2001 years			
Diploma Engineering	Teaching	9.08	15.93	-6.85	-3.141	.007***
	Engineering	62.39	64.41	-2.02	-.405	.692
	Administration and Management	12.10	3.22	8.88	1.588	.135
	Clerical and Office work	6.01	3.20	2.81	2.971	.010***
Graduate Engineering	Teaching	9.14	15.04	-5.90	-2.343	.034**
	Engineering	62.37	32.23	30.13	8.947	.000***
	Administration and Management	10.93	2.86	8.07	1.993	.066*
	Clerical and Office work	4.96	5.00	-0.03	-.017	.987

*** significant at 1% level, *significant at 10* level

The independent sample 't' test is conducted to know the difference in the employment function of the engineers before the year 2001 and since 2001. Among the diploma engineers it is found that the increase in the teaching function performed by the diploma engineers and the fall in the clerical work performed by the diploma engineers is statistically significant. At the same time an increase in the engineering function of the diploma engineers and the fall in the administration function of these engineers is not statistically significant. Thus it can be concluded that the argument of majority of diploma engineers in engineering functions right from its beginning is statistically found relevant and is stable over the years. The period of passing has not resulted in any changes in the function rendered by the diploma engineers. This observation further consolidates the stand that diversion is less among the diploma engineers.

Among the graduate engineers it is found that the fall in the engineering function after the year 2001 and increase in teaching and also in the administration that is performed by them is statistically significant. The data shows that an increase in the clerical function performed by the graduate engineers is merely a coincidence and statistically not significant whereas others are statistically significant. Thus a fall in the engineering services after the year 2001 is facilitated by an increase in the software opportunities available to the graduate engineers. The changes in the software function between these two periods is however, not analysed because of the absence of adequate information regarding employment in software industry before 2001.

4.3.3 Employment Function of the Diploma and Graduate Engineers in Kerala- Descriptive Analysis Based on Primary Data

The teaching profession is considered to be one of the major destinations of employment in the recent years as there has been a drastic spurt in the number of institutions imparting technical education. As the growth of the graduate engineering courses outnumbered the diploma institutions, the teaching profession is more open at the graduate level institutions compared to the diploma level institutions. The profession of teaching is also considered to be one of the major destination of employment but at the engineering level, the teaching as a professional choice was least accepted by the academically proven student community because of the low profile associated with the profession in engineering. There have been occasions when those students who were declared as unfit by the industry only opted for higher studies in order to qualify for the post of teaching. Teaching was not an attractive profession because they were not adequately paid in comparison to those working in industry (B L Koul, Naresh Dubey, D L Verma, 2005)[6]. Therefore, higher study was pursued only by those who choose to keep their state of unemployment in disguise. This fact is contrary to the observations in the conventional stream of education where opportunities available for higher studies are preferred to employment.

In the recent past owing to high remuneration offered at the teaching level and owing to the stringent imposition of rules and regulations by the authorities like the AICTE and other bodies, the teaching profession is preferred by certain sections of the student community at the engineering level, particularly by those who are more prone to personal and social immobility. These students, therefore, pursue higher studies in order to qualify themselves fit for the role of teaching.

The other and most important function sought by engineers is engineering related service and it is accepted as the best career choice through the campus placements or other means. This is because the earlier employment recognizes the quality of student skill believed to be essential for industry. The student may be engaged in various engineering related services that include

[6] B L Koul, Naresh Dubey, D L Verma. (2005). Perspective of Technical Manpower Requirements and Demands. In T. M. Planning, & D. M. Dr.M.Sudhir Reddy (Ed.), *Technical Manpower Planning in India Issues and Concerns* (Vol. II, pp. 97-109). New Delhi: Discovery Publishing House .

production and operation, sales and service related to the engineering, maintenance and repair, research and development, etc.

The branch-wise difference in the engineering related services is observable because of the nature of the branch. If in some branch the function is directly related to the production of an output, in others the function rendered is operational in nature which does not result in the creation of any tangible output. There are others where only services are rendered through the functions performed. But production and operation in total constitute the large chunk of the engineering related services with 48 per cent of engineers in this function being at diploma level. Among the graduate engineers also the function of engineers in engineering related service is very high in production and operation with 25.4 per cent employment. The research and development as a function of employment has a limited scope at diploma level because of the peculiarity at this stage of education and hence incidence of this function is null here. For graduate engineers R&D is an opening that can be widely explored but is abysmally low with only 3.3 per cent of employed engineers being employed in the area of research and development.

The design and planning is another important area where the engineers can find potential employment and is considered to be the part of engineering related services. It is also observed that such a function is not equally important for all branches of study and there are incidences of heavy concentration in this function by some particular branch, such as architecture and civil. Apart from this the design and planning as a source of employment is more important for the diploma holders with 19 per cent of employed engineers in this particular function but among the graduate engineers, the function is irrelevant with only 1.7 per cent of employed engineers in design and planning (See Appendix IV Table 4.3.1 &4.3.2).

The other function of employees outside the area of engineering is in the capacity as administrators and managers. The engineers in the role of an administrator and manager is significant only for the graduate engineers, because the surveyed data collected after a period of two years is sufficient enough for obtaining a management degree only for graduate engineers. At the diploma level the scope of engineers in administration and management is limited because such functions cannot be rendered with a mere diploma certificate except in the case of a self employed engineers but it is observed that even if there are no incidences of self employment at the diploma level, a marginal 1.1 per cent of employed diploma engineers are in the administration and management in very small entities whereas 4.2 per cent of the employed graduate engineers are in the administration and management.

Apart from the above, the spurt in the Information Technology and ITES (Information Technology Enabled Service), software industry and other computer related employment in recent years is a good opening for many of the engineers, irrespective of the branch of study. The various functions in this respect include software development, hardware maintenance and repairs and ITES. The engineering education both at the diploma and graduate level imparts training for the development of this skill and, therefore, the functions rendered here is good enough to be analysed for its importance in the various branches of study. But the software industry is important only for students at graduate level and it has only limited scope for employment at the diploma level. At graduate level the engineer’s highest employment provider is Software, Hardware and IT enabled service other than the core engineering services with 33.9 per cent of employed graduate engineers being in this sector if each function is considered independent.

The other functions rendered by the engineers are in the capacity of an office clerk where the employed engineers are in banks, insurance companies. At the diploma level, the branch of commercial practice however expects to make the students capable of performing clerical duties but in other branches the engineering students functioning as clerks is a true incidence of diversion and underemployment. Similarly at the graduate level absorption of engineers in banks and insurance companies as clerks is an indication of underemployment and diversion of employment to other areas. The data shows that across all the branches, 6.8 per cent of the diploma engineers and 7.4 per cent of the graduate engineers are working as clerks.

The important functions rendered by the engineers across various branches of study, at the diploma level and graduate level, is analysed in order to check the strength of the branch of study in determining the functions of the engineers.

4.3.3.1 Employment Function of the Engineers in Kerala and Their Branch of study

The employment function for the diploma engineers is arranged in such a way that the production/operation, sales /service, maintenance and repairs, design and planning, research and development are considered as engineering related service. In this form of arrangement the data shows that 8.6 per cent of the diploma engineers are in the teaching profession, 76.7 per cent of the engineers are in the engineering related services, 1.1 per cent of the engineers are in the administration and management, 3.9 per cent of the engineers are working in the software or hardware industries and the rest 9.7 per cent of the engineers are in the clerical work. The diploma engineers are, therefore, found to be highly engaged in engineering related services for all branches compared to all other functions as given in Table 4.12

Table 4.12 Branch-wise Employment Function of the Diploma Engineers in Kerala

Branch of study	Teaching		Engineering related services		Administration /Management		Software		Clerical/Office work		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Civil, Architecture and related branches	3	7.1	37	88.1	0	-	0	-	2	4.8	42
Commercial Practice	0	-	0	-	0	-	0	-	10	100.0	10
Computer Engineering	2	5.3	18	47.4	2	5.3	11	28.9	5	13.2	38
CABM,CHM, and I T	4	20.0	13	65.0	0	-	0	-	3	15.0	20
Electrical	5	15.2	28	84.8	0	-	0	-	0	-	33
Electronics& Applied Electronics	8	22.9	26	74.3	1	2.9	0	-	0	-	35
E&C and other related branch	2	11.8	13	76.5	0	-	0	-	2	11.8	17
Mechanical	0	-	36	92.3	0	-	0	-	3	7.7	39
Others	0	-	43	95.6	0	-	0	-	2	4.4	45
Total	24	8.6	214	76.7	3	1.1	11	3.9	27	9.7	279

Source: Field survey

The table 4.13 for the graduate engineers shows that 13.7 per cent of the employed engineers are in teaching. It is also observed that the 40.8 per cent of the employed engineers perform their function in engineering related services. The 4.2 per cent of the employed engineers are in the administration and management, 33.9 per cent of the employed engineers are in the software and 7.4 per cent of the employed engineers are in the clerical or office work. Thus it is observed that the employed graduate engineers, even if they are largely in the engineering related services but are relatively fewer as compared to the diploma engineers in this form of arrangement. Hence it can be added that if the opportunities other than engineering for employment had not been available among the graduate engineers in other non engineering areas the problem of unemployment among the graduates would have been more serious and grave.

Table 4.13 Branch-wise Employment Function of the Graduate Engineers in Kerala

Branch of study	Teaching		Engineering related service		Administration /Management		Software		Clerical/Office work		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Civil and Architecture	16	27.1	35	59.3	2	3.4	1	1.7	5	8.5	59
Computer Science	12	9.0	10	7.5	4	3.0	99	73.9	9	6.7	134
Electrical and Electronics	23	16.9	76	55.9	7	5.1	26	19.1	4	2.9	136
Electronics and Communication	19	11.4	44	26.3	5	3.0	78	46.7	21	12.6	167
Information Technology	12	18.8	4	6.2	6	9.4	34	53.1	8	12.5	64
Mechanical	13	12.1	83	77.6	1	0.9	7	6.5	3	2.8	107
Others	9	9.8	58	63.0	7	7.6	12	13.0	6	6.5	92
Total	104	13.7	310	40.8	32	4.2	257	33.9	56	7.4	759

Source: Field survey

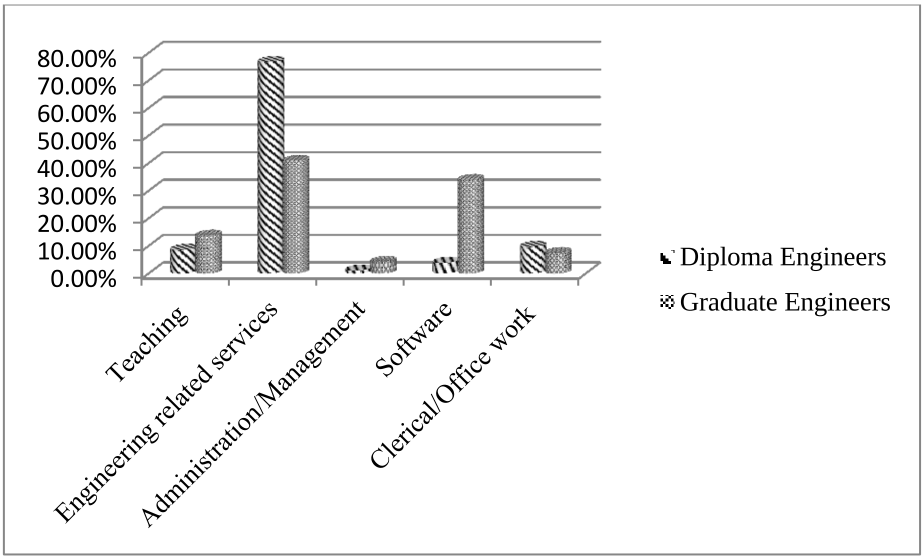

Figure 4.4 Employment Function of the Diploma and Graduate Engineers in Kerala

The diploma engineers being more in engineering is mainly because of the less scope of employment among them in non-engineering areas. The software is considered as a good opening of employment among the graduates which is however denied to the diploma engineers because of its peculiarities. It is also to be observed that except in engineering and clerical work the graduates are relatively more in function than the diploma engineers.

4.3.3.2 Employment Function of the Male and Female Engineers in Kerala

It is a known fact that the Indian women are prevented from duties that are considered socially prohibitive. The attitude of reservations against women rendering such duties inhibits them from undertaking all responsibilities even if they are competitive enough to do so. Thus accepting that the females had to limit their work within the four walls of kitchen or to the extent of being only in farm works after the kitchen hours kept the females away from the mainstream in education. The enrolment of females at all the levels of education was, therefore, very low. Later with the economic progress and development taking greater pace, an attitudinal change in favour of women education was witnessed. But as we move to the higher area of learning it is not widely evident. To reckon with, in the technical education the female enrolment is abysmally low.

The employment function of the engineers among the different gender groups is analysed in order to know gender inhibitions and obstructions in rendering some functions particularly by women. There are many compulsions that prevent the women engineers from such duties. The employer's reluctance in accepting women in some functions also discourages women from undergoing training in those areas. Thus each function rendered by the engineers has gender characteristics associated with it represented by the strength of the males and females in those capacities. For instance, the participation of women engineers in management is low (P P Parikh, 2004). It is only 7.6 per cent at the lower management level and falls to 2.4 per cent at the upper level[7]. The study also revealed that the opinion of executives and employers was that the most suitable job for female engineers was teaching and the best specialisation suitable for females was computer science engineering. It is also generally observed that, other things being equal, employers coming for the on-campus recruitment prefer male to female candidate owing to the factor that the companies might be feeling that male employees tend to work for longer hours while females have family obligations which prevent them from being more flexible in time[8]. As a result the female preference for jobs in administration and management is less.

[7] PP Parikh and S P Sukhatme, Women Engineers, *Economic and Political Weekly* January 10, 2004

[8] Choudhury, P. K. (2014, Novemeber). What Explains the Gender Discrimination in Employment and Earnings of Engineering Graduates in India? *DSAI Working Paper*, pp. 1-32.

The data for the diploma engineers when analysed shows that among the diploma engineers relatively more of the male engineers are in the engineering related services, whereas the females are relatively more in the non engineering related services like teaching, administration and management, software and clerical works.

Table 4.14 Employment Function of the Male and Female Diploma and Graduate Engineers

Course of Study	Teaching		Engineering related service		Administration/ Management		Software		Clerical/Office work		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Diploma Engineers											
Male	7	3.7	167	88.4	2	1.1	4	2.1	9	4.8	189
Female	17	18.9	47	52.2	1	1.1	7	7.8	18	20.0	90
Graduate Engineers											
Male	35	7.9	255	57.3	13	2.9	119	26.7	23	5.2	445
Female	69	22.0	55	17.5	19	6.1	138	43.9	33	10.5	314
Total	128	12.3	524	50.5	35	3.4	268	25.8	83	8.0	1038

Source: Field survey

For the graduate engineers also the female engineers are relatively more in the non engineering related services particularly in teaching, administration and management, software and clerical work. The relative strength of females is the highest in the software field with 43.9 per cent of the employed female engineers. The relative strength of the employed male engineers on the other hand is the highest in the engineering related services with 57.3 per cent of the male engineers in this field.

The study shows that even if the enrolment of the females in the engineering profession has increased over a period of time their absorption in the respective field of study is not ensured because of various factors beyond the scope of our study. The female engineers are forced to divert to non engineering areas of employment. Thus mere enrolment of the female engineers does not ensure gender equality, but steps should be initiated towards the engagement of the women engineers in employment at least in the engineering areas so that the potential level of output and work satisfaction across gender is accomplished.

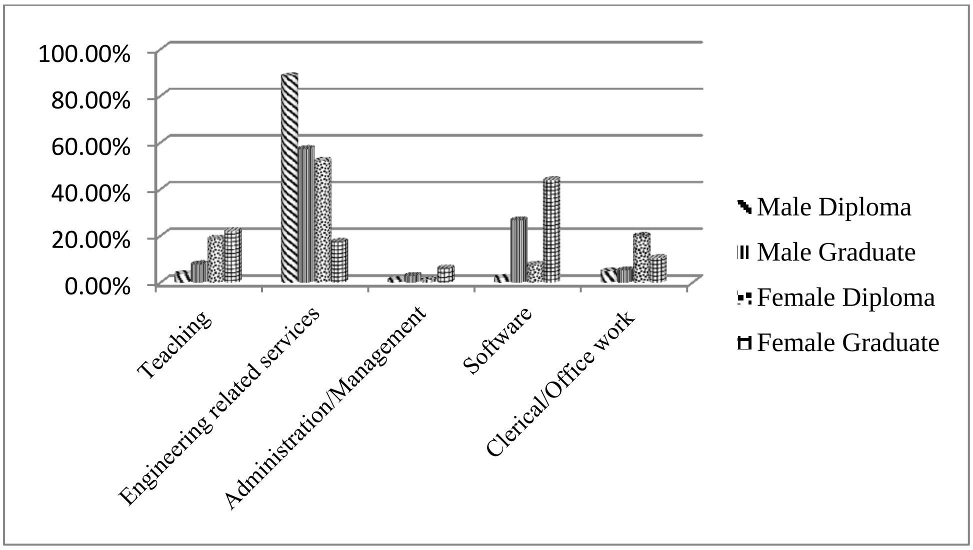

Figure 4.5 Employment Function of Male and Female Diploma and Graduate Engineers

Since more of the female engineers have diverted to non-engineering areas because of no job opportunities it is to be presumed that the employer's preference for the female engineers is less. The employment of more females in Teaching and clerical job is mainly attributed to the preference revealed by the female engineers because of the unique nature of such jobs. As the employment of females in administration and management is either equal to or more than the male engineers it can be inferred that the females are less inhibited towards taking jobs in administration and management in Kerala which is brought by a favourable social attitudinal change.

4.3.3.3 Employment Function of the Engineers in Kerala and Their Social Category

The engineers belonging to various social categories are also employed to render different functions to their capacity. But the social conditions existing in India are such that students are discriminated against in the name of caste and creed. Hence equal and even distribution in each function among the entire social categories of students is not expected and assumed among the engineers. The studies conducted earlier showed that the software companies preferred recruiting engineering graduates rather than the diploma engineers and the percentage of them belonging to OBC, SC and ST categories continues to be much lower than their percentage in the population, and that of higher castes correspondingly much higher (Carol Upadhya, 2007)[9]. Further upper caste Hindu youth are two to four times more likely to be graduates than are youth from the OBC, SC, ST categories and Muslims (Deshpande 2006; Deshpande and Yadav 2006: Mohanty 2006)[10]. Thus in total the engineers from backward class is likely to be less employed than their forward caste counterparts affecting the strength of these students in this function.

[9] Carol,Upadhya. (2007, May). Employment, Exclusion and Merit in the Indian IT Industry. *Economic and Political Weekly, 42*(20), 1863-68

[10] Deshpande, S. (2006, June). Exclusive Inequalities: Merit, Caste and Discrimination in Indian Higher Education Today. *Economic and Political Weekly*, 2438-444.,

Satish Deshpande and Yogendra Yadav. (2006, June). Redesigning Affirmative Action, Castes and Benefits in Higher Education. *Economic and Political Weekly, 41*(24).

Mohanty, M. (2006, September). Social Inequality, Labour Market Dynamics and Reservation. *Economic and Political Weekly, 41*(35), 3777-89.

Table 4.15 Employment Function of the Diploma and Graduate Engineers in Kerala among Different Social Groups

Course of Study & Social Category	Teaching		Engineering related service		Administration/ Management		Software		Clerical/Office work		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Diploma Engineers General category	2	2.9	55	80.9	1	1.5	5	7.4	5	7.4	68
OBC	21	11.2	143	76.5	1	0.5	5	2.7	17	9.1	187
SC and ST	1	4.2	16	66.7	1	4.2	1	4.2	5	20.8	24
Graduate Engineers General category	47	11.8	152	38.3	14	3.5	162	40.8	22	5.5	397
OBC	50	15.3	141	43.3	15	4.6	91	27.9	29	8.9	326
SC and ST	7	19.4	17	47.2	3	8.3	4	11.1	5	13.9	36
Total	128	12.3	524	50.5	35	3.4	268	25.8	83	8.0	1038

Source: Field survey

In the present study the data for the diploma engineers shows that students belonging to general category students are relatively higher in the engineering related services and in software industries compared to the students belonging to other categories. This is in consonance with the early findings where it is found that in the IT sector the recruitment of the students belonging to the general category is favoured over the others and there is blatant evidence of discrimination against the students belonging to backward community but in the present study it is observed that the spread of employment and the function rendered based on their caste is not in accordance to the degree of their backwardness because next to the general category, the students of SC and ST are employed in the software industry. It is also observed here that the diploma engineers, belonging to general category are more employed in the engineering related services than engineers belonging to the OBC category who render their functions more in the capacity as teachers and the SC/ST students are relatively more employed in clerical and office works.

For the graduate engineers the observations are against what is seen among the diploma engineers because function-wise analysis shows that the relative strength of SC and ST students is high in teaching, engineering related services, administration and management and in clerical work. In the area of software development and IT, the relative strength of students belonging to the general category is greater than the other two groups. The social category-wise analysis also shows that the relative strength of the general category engineers is high in software compared to other functions, whereas among the OBC and SC/ST the relative strength is higher in the engineering related services compared to other functions.

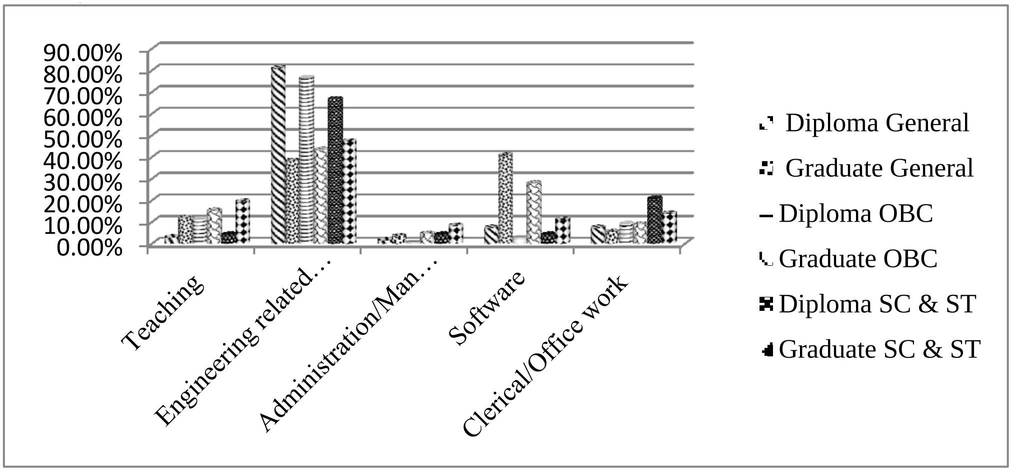

Figure 4.6 Employment Function of the Diploma and Graduate Engineers and Their Social Category

Considering function-wise analysis of employment, the diploma engineers belonging to the general category are found more in the engineering related services primarily because other areas of employment is less preferred and they succeed to get employment in their respective area of study. The constraints faced in search of employment in core areas of engineering is considered very high among the graduate engineers as majority of them are able to find easy employment in the software.

4.3.3.4 Employment Function of the Engineers in Kerala and Their Parental Education

The choice of the profession of a student is largely influenced by the level of parental education. The Indian society with an observable obsession towards ancestral occupation, the career choice of the students is likely to be influenced by the professional occupation of their parents. Hence the level of parental education is likely to affect the choice of the career and also the functions rendered in the capacity as a professional.

The earlier studies based on the data collected with regard to the software professionals reveals that most software engineers come from middle class, educated families. Taking parents' education and occupation as a proxy for socio economic class, the survey of software professionals in Bangalore found that 80 per cent of their fathers had graduate degree or above while only 2 per cent had fathers with less than SSLC. In addition 56 per cent of respondents' mothers were graduates or above. Another survey of 102 software engineers in Bangalore revealed that 77 per cent of fathers had postgraduate degrees and the rest had at least completed high school. The mothers in the sample were similarly highly educated with the majority of them up to high school level and half with graduate degree (Krishna and Brihmadasem, 2006)[11].

Thus the earlier studies reveal that the level of parental education does influence the employment prospects of the engineers, thereby influencing the employment function of the engineers. The data as revealed shows that the level of parental education of the students affects the employment prospects of the students because the educated parents can guide the students in choosing their employment and hence the functions performed by these students. But this may not hold true and significant for all the engineers because the functions performed by engineers do not solely depend upon the level of parental education alone but also are influenced by other factors. The extent to which such an influence has played its role in the employment function of the diploma and graduate engineers is analysed here.

The level of parental education is compiled based on the information obtained about the father's educational qualification and mother's educational qualification. If both the parents did not qualify the matriculation level they are considered as with low education and if any of the parent have attained education beyond matriculation till undergraduate level they are treated as educated and if any of the parents have attained education above graduation or any of the professional qualification they are treated as parents with high education level.

[11] Anirudh Krishna and Vijay Brahmadesam. (2006, June- August). What Does It Take to Become a Software Professional? *Economic and Political Weekly, 41*(30), 3307-3314.

Table 4.16 Employment Function of the Diploma and Graduate Engineers and Their level of Parental Education

Course of Study and Level of Parental Education	Teaching		Engineering related service		Administration/ Management		Software		Clerical/Office work		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Diploma Engineers											
Low educated parents	24	10.7	168	74.7	2	0.9	10	4.4	21	9.3	225
Educated parents	0	-	29	80.6	1	2.8	1	2.8	5	13.9	36
Highly educated parents	0	-	17	94.4	0	-	0	-	1	5.6	18
Graduate Engineers											
Low educated parents	27	16.2	81	48.5	3	1.8	42	25.1	14	8.4	167
Educated parents	16	12.1	52	39.4	7	5.3	47	35.6	10	7.6	132
Highlyeducated parents	61	13.3	177	38.5	22	4.8	168	36.5	32	7.0	460
Total	128	12.3	524	50.5	35	3.4	268	25.8	83	8.0	1038

Source: Field survey

The survey findings show that for all the levels of parental education, the employment function of diploma engineers is in the engineering related services and it is interesting to observe that none of the students belonging to educated and highly educated parents are engaged in teaching implying that teaching is least preferred even by the students of educated and highly educated parents.

The data for graduate engineers again shows that engineering related services is the function performed by the majority of the engineering students for all their levels of parental education and software is the next important function of the graduate engineers. The data for the graduate engineers also shows that the least function is in the administration level for all the levels of parental education.

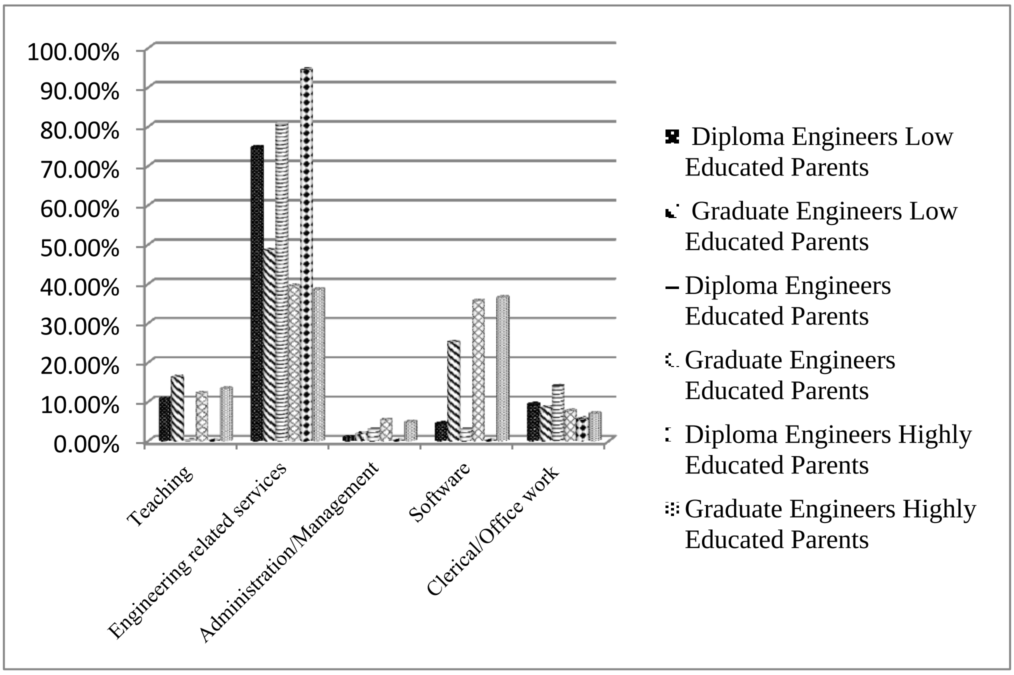

Figure 4.7 Employment Function of the Diploma and Graduate Engineers and Their Level of Parental Education

The diploma engineers of highly educated parents reveal their preference for being in engineering whereas among the graduates, the engineers belonging to that category reveal equal preference for engineering as well as software. This is because the graduates do not discriminate between these two types of jobs in getting employment as they are equally attractive.

4.3.3.5 Employment Function of the Engineers in Kerala and Their Area of Residence

The area of residence implies the background of students with respect to the degree of development in their area of residence. It is a fact that in India there is a wide regional difference in development and hence evidences of rural urban divide are more exposed. The attitude and aptitude of the population in rural area and urban area are influenced by the situations and experiences they come across in life. The attitude towards each job, therefore, affects the acceptance of an employment function among these groups of people.

The students hailing from their respective areas are educationally influenced by the facilities available in their area of residence, for instance the availability of schools, its type and the quality of education offered, etc. which in other ways also influence the employment profile of the students.

A study on the group of IT professionals reveals that a very high number of people who have been children of significant economic and social disadvantage are broken free from their background and are treated on a par by their employers (Bagchi, 2006)[12]. Similarly the same study also reveals that 33 per cent of new recruits were from rural, agricultural backgrounds while 20 per cent were from small business families. The survey report of the other study shows that 36 per cent of the sample were born in one of the five metros (including Bangalore) 29 per cent were from tier two towns and cities such as Mysore and Pune and only 5 per cent came from rural areas and 31 per cent came from tier three towns including district and taluk headquarters and smaller semi urban areas. The figures hence for the IT industry show that the

[12] Bagchi, Subroto . (2006, January 13). Bunti aur Babi. *Times of India*.

sector has not opened up significant new opportunities for people from rural areas, contrary to common perception.[13]

In this background with too many of contrasting observations it is important to focus on the influence of the area of residence of students in determining their employment function among the diploma and graduate engineers in Kerala. The incidence of such difference is likely the monetary attractions overplaying other factors of job, pulling the engineers away from their core areas of study. The extent of this difference among the rural and urban students is analysed for the function rendered in their post employment status.

The data for the diploma engineers shows that the diploma engineers from both the rural and urban areas are relatively more in the engineering related services. In contrast to the above earlier findings the students of rural areas are more than the urban areas in the field of software at diploma level. This indicates the uniqueness of development in Kerala where the rural urban divide is narrow in contrast to the rest of India.

The data for the graduate engineers, however, shows that the students from rural areas are relatively more than the urban students in teaching, engineering related services and clerical work whereas the students from the urban areas are relatively more in administration and management and also software.

[13] Carol Upadhya, C. (2007, May 19). Employment, Exclusion and Merit in the Indian IT Industry. *Economic and Political Weekly, 42*(20), 1863-68.

Table 4.17 Employment Function of the Diploma and Graduate Engineers and Their Area of Residence

Course of Study and Area of Residence	Teaching		Engineering related service		Administration/ Management		Software		Clerical/Office work		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Diploma engineers											
Rural	21	9.6	167	76.3	2	0.9	9	4.1	20	9.1	219
Urban	3	5.0	47	78.3	1	1.7	2	3.3	7	11.7	60
Graduate engineers											
Rural	76	16.1	206	43.6	12	2.5	142	30.1	36	7.6	472
Urban	28	9.8	104	36.2	20	7.0	115	40.1	20	7.0	287
Total	128	12.3	524	50.5	35	3.4	268	25.8	83	8.0	1038

Source: Field survey

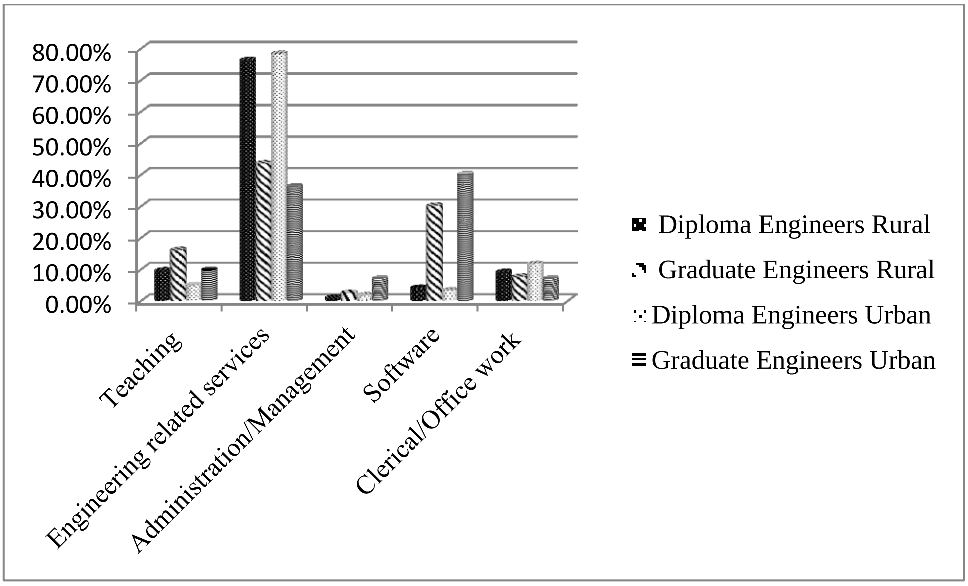

Figure 4.8 Employment Function of the Diploma and Graduate Engineers and Their Area of Residence

Since both the rural engineers and urban engineers are equally distributed in various functions, it shows that the urban rural divide of the population as observed in the demographic features of India is precisely absent in Kerala.

4.3.3.6 Employment Function of the Engineers in Kerala and Their Type of Institution of Study

The expansion of the institutions, particularly the engineering institutions of unaided type, resulted in the large outturn of engineering professionals unmatched by a corresponding proportionate expansion in the industrial and service growth. As a result, a large pool of the passed engineers remains unemployed and their skill remains underutilized. The adverse incidence of unemployment was largely arrested by the growth of IT sector in India in the recent years. Thus the crucial reason for the large number of engineering colleges coming up in states like Tamil Nadu, Andhra Pradesh and Karnataka is that they produce a vast majority of graduates who make up the workforce of the rapidly growing information technology (IT) sector. In fact for many years before the advent of IT, engineering was a prestigious discipline attracting only able students leading to good employment opportunities and engineering was a well-respected profession. But today the IT overshadows the rest of the branches in engineering in India and abroad and it is now taken for granted that the global success of the country's IT industry depends on its vast pool of graduates qualified in engineering, and in cognate scientific and technological disciplines (C J Fuller, 2006)[14].

The other important fact is that the IT industry with global presence is highly competitive and their recruiting policy is such that they are in search of

[14] Fuller C J and Haripriya Narasimhan. (2006, January). Engineering Colleges, Exposure and Information Technology Professionals in Tamil Nadu. *Economic and Political Weekly, 41*(3), 258-262.

the best talents available, irrespective of the branch of study and hence they limit their recruitment in reputed colleges. The other newly established institutions with poor academic performance are out of the domain of good IT companies. In Tamil Nadu most of the graduate engineers are selected from a fairly small number of institutions and these include Anna University , the government and state aided engineering colleges and about 20 or 30 of the best private colleges and deemed universities located in and around Chennai and some other cities in Tamil Nadu, notably Coimbatore[15]. Hence a natural imbalance is created leading to uncertainty in the scope of employment of the students studying in the new institutions or in institutions that failed to gain repute equal to their counterparts established with proven academic records. The institutional breakup of the employment functions of the students, therefore, becomes necessary in order to analyse its effect on the employment function among both the diploma and graduate engineers.

The students hailing from the various types of institutions are in different employment functions and they reveal the influence of institution on the employment function of the engineers. This is because the employment absorption and thereby the employment function of the engineers are associated with the repute of the institution. An institution with good repute is characterized by frequent visits by industry experts offering employment which is relatively low for diploma engineers because only marginal number of campus visits are found in diploma colleges. The number of campus visit by industries and institutions for employment more or less determines the possibility of employment and also the functions performed by these engineers.

[15] Ibid

The data for the diploma engineers in Kerala classified on the basis of the type of institutions shows that the engineering related services is the major function for all engineers irrespective of the type of institution of their study. For private unaided students, engineering related services is the only avenue of employment among the diploma engineers.

Table 4.18 Employment Function of the Diploma and Graduate Engineers and Type of Institution of Study

Course of Study and Type of Institution	Teaching		Engineering related service		Administration/ Management		Software		Clerical/Office work		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Diploma engineers											
Govt College	22	9.6	170	73.9	3	1.3	11	4.8	24	10.4	230
Private Aided College	2	5.4	32	86.5	0	-	0	-	3	8.1	37
Private Unaided College	0	-	12	100.0	0	-	0	-	0	-	12
Graduate engineers											
Govt College	40	11.4	158	45.0	18	5.1	105	29.9	30	8.5	351
Private Aided College	16	19.3	42	50.6	3	3.6	20	24.1	2	2.4	83
Private Unaided College	48	14.8	110	33.8	11	3.4	132	40.6	24	7.4	325
Total	128	12.3	524	50.5	35	3.4	268	25.8	83	8.0	1038

Source: Field survey

The function-wise analysis for the graduate engineers based on the type of their institution of study however shows that for students belonging to the government colleges, software is their cup of tea. The majority of the graduate engineers from private unaided colleges are in the software followed by the engineering related services.

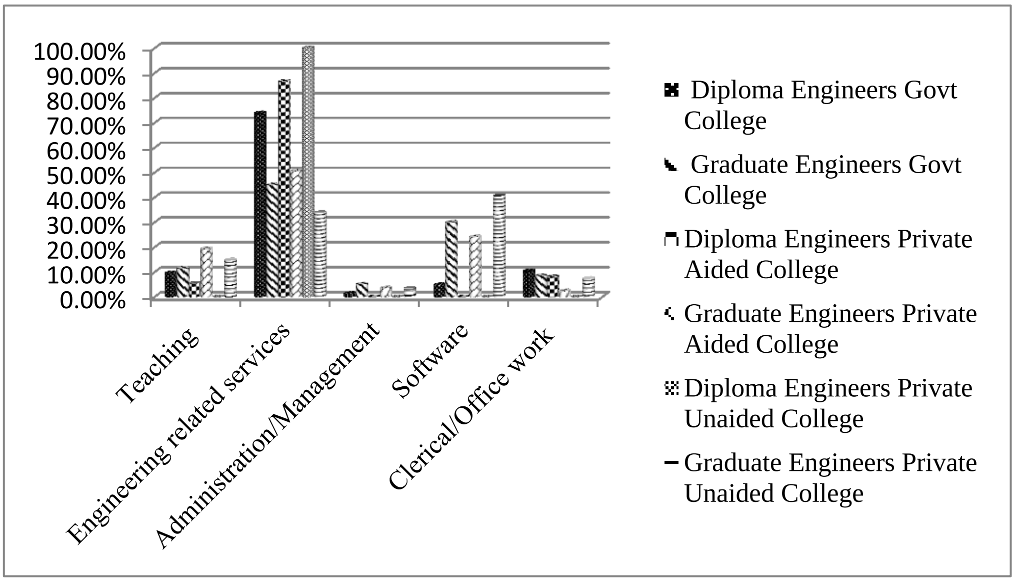

Figure 4.9 Employment Function of the Diploma and Graduate Engineers and Their Type of Institution of Study

If engineering is the only avenue of employment among the diploma engineers of private unaided colleges, the graduates from these colleges are working more in software because these institutions manage to get higher employment with active placement facilities.

4.3.4 Employment Function of the Diploma and Graduate Engineers in Kerala- Inferential Analysis of Primary Data

The employment function of the diploma and graduate engineers shows that it is not uniform across all characteristics and the influence of some factors on the employment function is strong whereas the influence of others is weak. The chi-square results of the difference in the employment function across various factors is given below

Table 4.19 Employment Function of the Engineers in Kerala: Chi-square Results

Course of Study	Characteristics	Category	Chi square Value	df	Sig.
Diploma	Employment Function	Branch	212.161	32	.000***
Graduate	Employment Function	Branch	303.552	24	.000***
Diploma	Employment Function	Gender	46.310	4	.000***
Graduate	Employment Function	Gender	125.594	4	.000***
Diploma	Employment Function	Social Category	14.100	8	.079*
Graduate	Employment Function	Social Category	25.439	8	.001***
Diploma	Employment Function	Parental Education	9.907	8	.272
Graduate	Employment Function	Parental Education	12.353	8	.136
Diploma	Employment Function	Area of Residence	1.813	4	.770
Graduate	Employment Function	Area of Residence	21.296	4	.000***
Diploma	Employment Function	Type of Institution	7.638	8	.470
Graduate	Employment Function	Type of Institution	23.896	8	.002***

***significant at 1 % level,** significant at 5% level,*significant at 10% level

The chi-square result shows that the branch of study, gender and their social characteristics have a significant influence on the employment function both among the diploma and graduate engineers whereas the area of residence and type of institution of study have a significant influence on the employment functions only among the graduate engineers.

4.4 Sector of Employment of the Diploma and Graduate Engineers of Kerala

The sector of employment refers to the nature of ownership and management of the firm where the employee is working. In a mixed economy the public sector and the private sector coexist but the objectives of recruitment are different. The government and the public sector which are more committed towards their social responsibility recruit people also from the socially and economically deprived members. But in the private sector merit overrules all other principles of recruitment. The difference in recruitment policy between the sectors of employment indicates their objective of recruitment. If merit is the only consideration, definitely the profit motive dominates all other objectives of recruitment. To what extent the recruitment policies of the employers affect in the choice of employees with observable individual differences due to varied intrinsic characteristics influenced by the type of institution of study, the parental education and so on is a matter of interest. The dynamism of the engineering labour market reveals the extent of the sector -wise difference in employment based on these characteristics.

The sector of employment where the student seeks employment is classified on the basis of the ownership of the firms. In India during the beginning of the post independence period a deliberate attempt was made to reconcile with the socialist ideology and hence policies focusing more on the public sector dominance in the manufacturing and service sectors was followed during the early plan periods. The growing scope of employment in the public sector offered along with ensured social security coverage attracted many of the engineers in this sector and hence large number of engineers sought a preference for being employed in the public sector and the government sector. But with the economic reforms of the 1990s, the public sector and the government sector lost the status of being the major employment provider primarily because of the initiation of deliberate cuts in recruitment. The private sector with high salary and perks in some cases also attracted the employees towards this sector. This phenomenon got a further fillip with the IT revolution and outsourcing occupying a good position in the employment area and the new job providers entering the labour market. There are some other sectors of employment also which include the local bodies, the cooperative sector, the private sector, the multinational companies, etc. identified and recognized as the sectors of employment for the engineers.

The sectors of employment having a significant role in India, based on their conceptual framework include the following.

- Central Government Department: These are sectors of employment that are directly managed and controlled by the government of India functioning under the name of various departments supervised by a ministry. The pay and allowances of the employees here are fixed by the government with timely revisions as recommended by the pay commissions with employees working in good working conditions. It is believed that the employees here are satisfied with the job and salary offered, and therefore, has no intention of shifting their job unless offered with very high perks.

- State Governments Department: This is the sector of employment that are directly controlled and managed by the state government department functioning under the name of the various departments again supervised by a ministry. The pay and allowances of the employees here are fixed by the state government on the basis of the recommendations of the pay commission appointed by the state government. The employees are more or less satisfied with the pay and benefits offered with no immediate intention of shifting unless otherwise offered with highly attractive salaries.
- Local bodies: These are the areas of employment that are controlled and managed by the local self-government, such as panchayat, municipality and corporation offices. The employees here are also offered salary as fixed by the state government and are also more or less satisfied with the pay and benefits but are in search for other good job offers.
- Public Sector Undertaking: A public sector undertaking is the sector not directly controlled and managed by the government but by government appointed board or corporation with regulations as per the company act enacted by the Indian Parliament. The public sector undertakings in India are engaged in the production of various goods and services with wide range of investment in sectors from simple consumer goods to complex capital goods involving sophisticated technology. The opportunities of employment available in this sector are very high, but gradually declining in

India with the beginning of economic reform due to a drastic shift in economic policies favouring the private sector.

- Private sector: A private sector is an entity where the ownership is vested with the private individual popularly known as a private limited company or either it is a joint stock company or it is publicly owned with enforcement of the minimum wages act and hence the employees prefer seeking employment in these sectors due to higher level of satisfaction from income, working condition and prospects of career growth.
- Multinational Company: These are also called as transnational companies where the company has succeeded in spreading its production network across national borders promising higher remuneration and good working condition. The engineers working in these companies expect a higher level of satisfaction because of prospects of career growth and higher remuneration offered.
- Bank: Bank is another opening preferred by many of the engineers either because of the direct preference or otherwise chosen due to no job offer or opportunities from areas of engineering. It is observed that engineers now do not stay away from the banking profession, because of better remuneration and better career growth prospects ahead.
- Cooperative sector: It is a sector organized and managed by a body elected for administration by its stakeholders popularly known as the members of the society functioning mainly in the area of banking and other public utility functions. It is again observed that

some of the engineers are working in these cooperatives if other areas of employment are not open to them.

- Others: It refers to all other areas of employment mentioned before that is not considered as an important sector of employment because of the report of the least incidence of employment in these areas.

For analysis the students working in any of the government sector including local bodies have been included in the government sector, where as the private sector includes both the private and the multinational companies and others also include the banking and cooperative sector.

4.4.1 Sector of Employment of the Diploma and Graduate Engineers: Descriptive Analysis of Secondary Data

The sector of employment of the diploma and graduate engineers during the period 1986 to 2008 is analysed in order to find any significant and observable difference in the sector in which the engineers are employed. After liberalization the private sector took over the public sector as the major player in the industrial development of the economy. The impact of such policies was felt only after the year 2000 and hence its impact on the employment scenario at the engineering level is examined here. Therefore, the per cent of employment in each sector during the year 1986 to 2008 is collected and at the same time independent‘t’ test is conducted to examine the significance of difference in the sectors on which the engineers depend for employment preceding the year 2001 and the years since 2001.

Table 4.20 Sector of Employment of Engineers among the Diploma Engineers (in %)

Year	Employment of Engineers in Various Sectors in %						
	Central Govt.	State Govt.	Local Body	Public Sector	Private Sector	Cooperative Sector	Others
1986	28.32	16.60	4.27	11.23	36.01	0.61	2.93
1987	19.80	11.80	4.80	16.60	37.30	0.34	9.20
1988	20.50	16.80	1.90	9.10	44.80	1.20	5.70
1989	19.60	20.60	1.60	9.90	42.00	1.40	4.90
1993	7.70	13.00	0.00	6.00	71.40	1.20	0.60
1997	3.30	5.30	2.40	14.00	68.00	1.00	5.90
1999	4.10	6.70	2.90	18.20	61.00	0.80	8.20
2000	3.70	7.00	2.70	16.30	59.20	1.00	10.10
2001	3.70	6.70	3.20	15.80	59.90	1.10	9.70
2002	3.70	10.30	4.30	17.40	55.60	1.20	7.60
2003	4.30	4.40	0.50	5.80	80.90	1.80	2.10
2004	4.00	5.90	3.30	17.80	61.70	1.70	5.60
2005	4.00	5.90	3.30	17.80	61.70	1.70	5.00
2006	4.20	5.50	3.60	18.30	56.50	1.90	10.00
2007	5.00	6.60	1.30	4.20	71.10	0.90	11.10
2008	2.75	7.81	1.06	2.92	85.34	0.00	0.08
Average	8.67	9.43	2.57	12.58	59.53	1.12	6.17

Source: Annual Technical Manpower Review, Kerala, NTMIS reports for various years

The average percentage of employment in each sector during the period 1986 to the year 2008 classified on the basis of the ownership of the firm shows that the private sector is the major sector of employment among the diploma engineers.

Similarly the average percentage of employment among the graduate engineers in each sector during the period 1986 to the year 2008 is also computed.

Table 4.21 Sector of Employment of Graduate Engineers (in %)

Year	Employment of Engineers in Various Sectors in %						
	Central Govt.	State Govt.	Local Body	Public Sector	Private Sector	Cooperative Sector	Others
1986	13.24	18.68	1.95	40.00	21.05	0.69	4.32
1987	15.50	9.10	5.00	32.40	32.40	0.50	5.20
1988	9.90	13.60	1.20	22.00	48.00	0.60	4.70
1989	21.20	10.80	6.30	17.40	38.80	0.70	4.80
1993	12.00	11.30	0.00	12.40	62.30	0.00	2.00
1997	4.30	7.10	1.40	14.30	69.70	0.20	3.00
1999	5.80	5.20	1.00	12.00	71.80	1.00	3.30
2000	2.90	6.20	1.50	13.60	71.00	0.80	4.00
2001	4.40	6.30	1.60	7.20	74.10	0.30	6.00
2002	1.70	7.20	0.70	16.50	70.00	0.20	3.60
2003	7.20	13.80	2.20	10.60	57.80	5.90	2.50
2004	2.71	5.59	0.87	4.89	82.59	0.74	2.61
2005	2.71	5.59	0.87	4.89	82.59	0.74	2.61
2006	3.60	4.80	0.50	6.40	81.50	0.50	2.70
2007	3.40	12.80	0.40	4.30	75.60	1.50	2.10
2008	1.96	5.58	0.21	4.45	87.78	0.00	0.00
Average	7.03	8.98	1.61	13.96	64.19	0.90	3.34

Source: Annual Technical Manpower Review, Kerala, NTMIS reports for various years

Among the graduate engineers also the private sector is the largest employer as the average figure for the period shows that majority of the graduate engineers are working in the private sector. The next important sector is the public sector. But in the later years it is observed that the share of the public sector is declining and that of the private sector is increasing.

4.4. 2 Sectors of Employment of the Diploma and Graduate Engineers: Inferential Analysis of the Secondary Data

The difference in employment among the engineers on various sectors of employment comparing the period of the years before 2001 and since 2001, whether is significant or not is tested with the help of an independent 't' test. The summary of the results of both the diploma and graduate engineers are given in the table.

Table 4.22 Sector of Employment of the Engineers in Kerala During the Pre and Post 2001 Period: 't' test Results

Course of Study	Sector of Employment	Mean Values in %		Mean Difference	t Value	Sig (2- tailed)
		Pre 2001years	Post 2001years			
Diploma Engineering	Central Govt	13.38	3.95	9.42	2.723	.016**
	State Govt	12.22	6.64	5.58	2.704	.017**
	Local Body	2.57	2.57	0.00	.002	.999
	Public Sector	12.66	12.50	0.16	.057	.955
	Private Sector	52.46	66.59	-14.12	-2.215	.044**
	Cooperative Sector	0.94	1.28	-0.34	-1.343	.201
	Others	5.94	6.39	-0.45	-.254	.803
Graduate Engineering	Central Govt	10.60	3.46	7.14	3.144	.001***
	State Govt	10.24	7.70	2.54	1.270	.225
	Local Body	2.29	0.92	1.37	1.711	.109
	Public Sector	20.51	7.40	13.10	3.302	.005***
	Private Sector	51.88	76.49	-24.61	-3.190	.007***
	Cooperative Sector	0.56	1.23	.-0.67	-.969	.349
	Others	3.91	2.76	1.15	1.642	.123

***significant at 1% level, **significant at 5% level, *significant at 10% level

From the figures it is evident that among the engineers there is a drastic fall of employment in the government sector after 2001 whereas the role of the private sector has considerably improved and is the largest employer of engineers with increasing share as time progresses. The results also show that the among the diploma engineers the fall in the absorption rate in central government, state government departments and also an increase in the employment in private sector is statistically significant.

At the same time among the graduate engineers, the fall in employment in central government departments, and public sector whereas an increase in the employment in the private sector is also found statistically significant.

Thus the impact of liberalization is widely evident in terms of absorption of employment in various sectors of the economy as the private sector now is the largest employer of the engineers.

4.4.3 Sector of Employment of the Diploma and Graduate Engineers of Kerala- Descriptive Analysis of the Primary Data

The employment sector of the diploma and graduate engineers is examined in order to know the strength of the various factors determining the employment profile of the engineers, particularly the sectors in which they are employed. The factors that are likely to influence the sector of employment are the branch of study, their gender characteristics, the social category to which they belong, the type of institution of study, etc.

4.4.3.1 Sector of Employment of the Diploma and Graduate Engineers and Their Branch of Study

The sector of employment of the engineers across the various branches of study is significant because of the dynamic market conditions existing in the labour market leading to volatile employment conditions. Thus a branch of study which is presently popular may become unpopular sooner or later. The conditions in the employment market become worse because the outturn of the engineers takes a period of three to four years. In a volatile labour market the branch that is popular owing to high demand in the employment market during the exercise of option at the outset of the course in the engineering vanishes at the completion of the course resulting in frustration among the passed engineers. The non market economies however succeed in insulating them from this volatile labour market through deliberate interventions in the employment sector through proactive government and public sector recruitment. The importance of this sector arises because an economy can prevent itself from the external market shocks only by giving due priority to the public and government sector.

The engineering labour market is analysed among both the diploma and graduate engineers with respect to their employment in the various sectors of the economy in order to find the scope of each sector in the employment market, across the branch of their study, their gender characteristics, their social category, the type of institution of study, etc.

Sector of employment of the diploma engineers and their branch of study: Among the diploma engineers across various branches of study it is found that the private sector is the largest employment provider with 65.2 per cent of employed engineers finding employment in the private sector, whereas 18.3 per cent of the employed engineers are employed in the government sector and 14.3 per cent of the employed engineers are in the public sector. Taken together around 32.6 per cent of the employed engineers are in the government and public sector.

Table 4.23 Sector of Employment of the Diploma Engineers and Their Branch of Study

Branch of study	Govt Sector		Public sector		Private sector		Others		Total
	No.	%	No.	%	No.	%	No.	%	
Civil, Architecture and related branches	13	31.0	0	-	28	66.7	1	2.4	42
Commercial Practice	7	70.0	0	-	3	30.0	0	-	10
Computer Engineering	5	13.2	2	5.3	28	73.7	3	7.9	38
CABM,CHM, and I T	2	10.0	8	40.0	9	45.0	1	5.0	20
Electrical	10	30.3	3	9.1	20	60.6	0	-	33
Electronics and Applied Electronics	2	5.7	4	11.4	29	82.9	0	-	35
E&C and other related branch	2	11.8	4	23.5	10	58.8	1	5.9	17
Mechanical	4	10.3	17	43.6	18	46.2	0	-	39
Others	6	13.3	2	4.4	37	82.2	0	-	45
Total	51	18.3	40	14.3	182	65.2	6	2.2	279

Source: Field survey

Among the various branches of study, it is observed that in all branches of study except in the branch of commercial practice, the private sector is the major employment provider. In the branch of commercial practice, employment is mainly in the form of clerical and other office jobs which is now popularly outsourced by the private sector and hence employment in such forms is least available in private enterprises. The next important sector for the diploma holders is the government sector followed by the public sector with respect to the generation of employment.

Sector of employment of the graduate engineers and their branch of study: On the other hand the graduate engineers pursuing their studies in different branches of study are also employed in different sectors of the economy, but unlike the diploma engineers the graduate engineers have greater openings in the private sector and public limited companies. It is also interesting to observe that many of the graduate engineers find their employment in software irrespective of their branch of study. Hence only a few of the engineers are found employed in the central government and state government departments.

Table 4.24 Sector of Employment and Branch of Study of Graduate Engineers

Branch of study	Govt Sector		Public sector		Private sector		Others		Total
	No.	%	No.	%	No.	%	No.	%	
Civil and Architecture	9	15.3	2	3.4	46	78.0	2	3.4	59
Computer Science	14	10.4	0		112	83.6	8	6.0	134
Electrical and Electronics	23	16.9	21	15.4	89	65.4	3	2.2	136
Electronics and Communication	22	13.2	12	7.2	126	75.4	7	4.2	167
Information Technology	8	12.5	1	1.6	49	76.6	6	9.4	64
Mechanical	10	9.3	18	16.8	78	72.9	1	0.9	107
Others	8	8.7	13	14.1	65	70.7	6	6.5	92
Total	94	12.4	67	8.8	565	74.4	33	4.3	759

Source: Field survey

The table shows that 12.4 per cent of the employed graduate engineers are in the government sector and 8.8 per cent of the employed engineers are in the public sector. Hence taking the government and public sector together as government entities, it is observed that 21.2 per cent of the engineers seek employment at government level for employment whereas 74.4 per cent of the engineers are in the private sector. Among the branches of study relatively more of the students in the branch of electrical and electronics depend on the government sector for employment and the private sector is highly significant for the branch of computer science where 83.6 per cent of the employed students depend on private sector for employment. The employment in the sectors belonging to other categories is relatively higher among the graduate engineers compared to the diploma engineers implying that more of the graduate engineers have diverted to the banking and cooperative sector for employment compared to the diploma engineers.

It is observed that the large scale public sectors and electricity boards are the major recruiters of engineers in the branch of electrical and electronics but such presence is blatantly absent in the computer software and hardware. Therefore the computer engineers primarily depend upon the private sector for employment whereas the engineers in electrical and electronics are blessed also to be placed at government level.

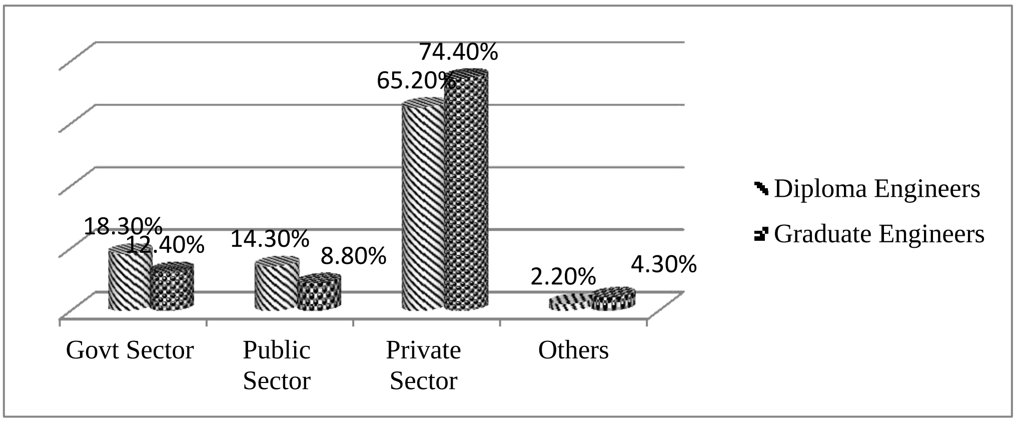

Figure 4.10 Sector of Employment of the Diploma and Graduate Engineers

The domination of the private sector in providing employment to the engineers is mainly an indication of the private sector taking greater role in the manufacturing sector in India and is therefore the largest employer.

4.4.3.2 Sector of Employment of the Engineers in Kerala and Their Gender Characteristics

Engineering is a profession where the women representation was seldom observed in earlier times, even in Nordic countries, known widely for their commitment to gender equity. The policies adopted for women integration into nearly all spheres of public life which ranks at the very top in its recent measure of women's status, the Gender Related Development Index(GDI) of United Nations Development Program (UNDP)1995, shows that in engineering, it is definitely a male occupation. Roughly 90 per cent of engineers in Finland and Norway were men in 1990 (Carolyn, 1987).[16] In this context the distribution of male and female engineers among the various sectors is necessarily to be analyzed to know the incidence of gender disparity in appointments.

The shift in the importance of sector for an occupation undergoes rapid changes with the change in the economic and social conditions of a society. The change in the importance of the sectors in an economy is evident from the sectoral contribution towards the GDP in the economy and also in the share of employment. In India, it is generally accepted that during the post liberalisation period, the focus shifted more towards the private sector affecting the level of output and also in the magnitude of generation of employment with an observable unique gender composition. A Study on Women Engineers in India conducted by the Indian Institute of Technology

[16] Jagacunski, Carolyn, J. (1987). Engineering Careers: Women in a Dominated Field. *Psychology of Women*, 97-110.

for the period 1975-1990 sponsored by the Department of Science and Technology shows that 66.3 per cent of the women engineers were employed, 2.4 per cent were self-employed and 5.2 per cent were post-graduate students. Sector-wise, the highest number of women engineers are working in educational institutions (26.9 per cent), followed by government/civil service (22 per cent), public sector (18.9 per cent), large scale private sector (12.79 per cent), small scale private sector(9.1 per cent) and government R&D (8.9 per cent). To what extent the gender composition works in the economy of Kerala in engineering employment is a matter of interest and is discussed below.

The engineering profession is now witnessing far reaching changes in terms of their gender composition with large enrolment of the females in the engineering profession which is also possibly evident in the sector of employment. The public sector which was conventionally considered as a comfortable destination for employment due to the security of the job is no more a centre of attraction for employment at present because of the changes in attitude among individuals towards life and the shift of priorities of life. Emphasis being given to the possible future earnings has unduly affected the priorities of the individuals even in the choice of the sector of employment. Hence private sector particularly the corporate sector, that promises more remuneration is preferred to the public sector among the larger chunk of the student population, particularly the engineers. With this new opening in the employment, many of the engineers are found working in the private sector. However the preference for the sector of employment for a particular gender or the preference among the genders for a particular sector may or may not exist.

Table 4.25 Sector of Employment of Diploma and Graduate Engineers and Their Gender Characteristics

Gender and Course of Study	Govt Sector		Public sector		Private sector		Others		Total
	No.	%	No.	%	No.	%	No.	%	
Diploma engineers									
Male	32	16.9	30	15.9	124	65.6	3	1.6	189
Female	19	21.1	10	11.1	58	64.4	3	3.3	90
Graduate engineers									
Male	49	11.0	52	11.7	333	74.8	11	2.5	445
Female	45	14.3	15	4.8	232	73.9	22	7.0	314
Total	145	14.0	107	10.3	747	72.0	39	3.7	1038

Source: Field survey

The table shows that among the various groups of diploma engineers categorized on the basis of their gender, both male and female engineers are largely working in the private sector with 65.6 per cent of males and 64.4 per cent of females respectively. In the government sector it is observed that relatively more of the female engineers are employed even if their absolute number is less. In the public sector more males are employed both absolutely and relatively. The other sector consisting of the banks and cooperative sector is insignificant in terms of the number of employment among the engineers but it is found that females have an edge over males because females enjoy higher aptitude in such kind of jobs compared to male engineers.

Among the graduate engineers just like the diploma engineers both the male and female graduate engineers are relatively more employed in the private sector and its rate is high as compared to the diploma engineers. In the government sector the relative strength of females is greater but it is not true for the public sector. In the sector identified as others, the females are more employed both absolutely and relatively signifying that the banks and cooperative sectors are more preferred by females.

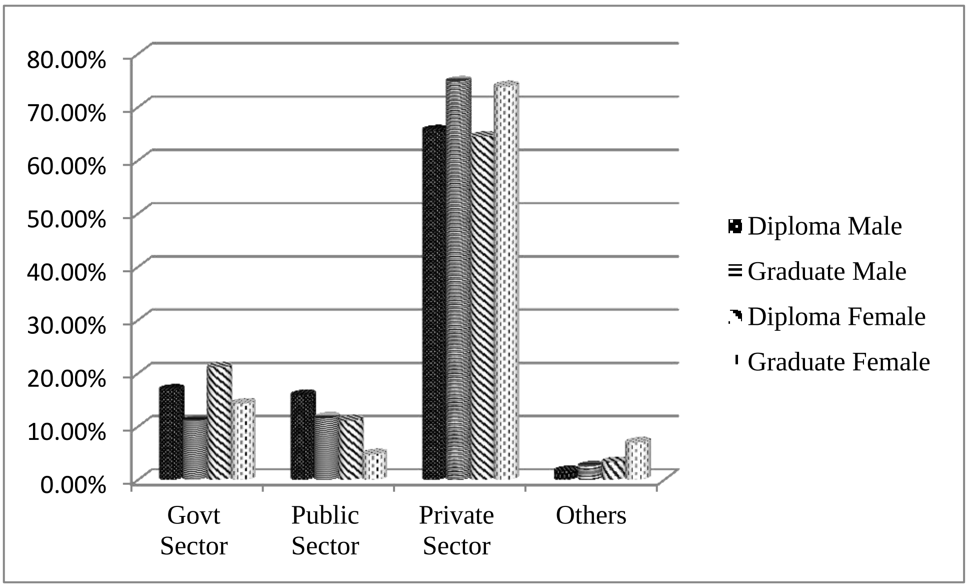

Figure 4.11 Sector of Employment of the Male and Female Diploma and Graduate Engineers

The male female difference within the group is not observable whereas the difference between the diploma and the graduate engineers for the same gender group shows an observable difference in the sectors in which the engineers are employed.

4.4.3.3 Sector of Employment of the Engineers of Kerala and Their Social Category

The engineers belonging to the social categories working in different sectors of the economy are also identified to throw light on the strength of each category of these individuals in their employment. In the Indian context the social classification based on caste system is very rigid and in an attempt to bring the backward and deprived social classes to the main streams of development the government has resorted to the policy of job reservation for these social categories. However such reservations based on caste cannot be imposed on the private sector as they are out of the domain of enforcement through government policies in appointment. The large share of the private sector and its role in the employment among the engineers definitely affect the employment prospects of the students who belong to the backward classes. The extent to which such discrimination is against the members of the backward class is analyzed both among the diploma and graduate engineers.

The data of diploma engineers shows that irrespective of the social category to which they belong all find employment in the private sector with relative advantage more among the general category students as 73.5 per cent of the engineers in the private sector belong to the general category. In the government and the public sector relatively more of the SC and ST students find employment implying that due to deliberate policy initiatives of the government through job reservations the underprivileged classes are benefited by the recruitment policies of the government particularly the SC and ST. However, such benefits have not reached the other backward classes if viewed from the perspectives of employment by these classes in the public sector as the engineers belonging to the general category are more in employment than the other backward category engineers in this sector.

Table 4.26 Sector of Employment of Diploma and Graduate Engineers and Their Social Category

Course of Study and their Social Category	Govt Sector		Public sector		Private sector		Others		Total
	No.	%	No.	%	No.	%	No.	%	
Diploma engineers									
General category	5	7.4	12	17.6	50	73.5	1	1.5	68
OBC	39	20.9	22	11.8	122	65.2	4	2.1	187
SC & ST	7	29.2	6	25.0	10	41.7	1	4.2	24
Graduate engineers									
General Category	35	8.8	30	7.6	317	79.8	15	3.8	397
OBC	49	15.0	32	9.8	232	71.2	13	4.0	326
SC & ST	10	27.8	5	13.9	16	44.4	5	13.9	36
Total	145	14.0	107	10.3	747	72.0	39	3.7	1038

Source: Field survey

The data for the graduate engineers also shows that irrespective of the social category, the private sector is the major employment provider for all and within the private sector relatively more of the general category engineers find employment. While comparing other sectors in terms of the relative strength of engineers employed in a particular sector it is observed that both in the government sector and public sector relatively more of the engineers belonging to SC and ST category succeed in getting employment followed by the OBC's. It implies that the government policy in recruitment through reservation for the socially and economically underprivileged graduate engineers has produced the desired results.

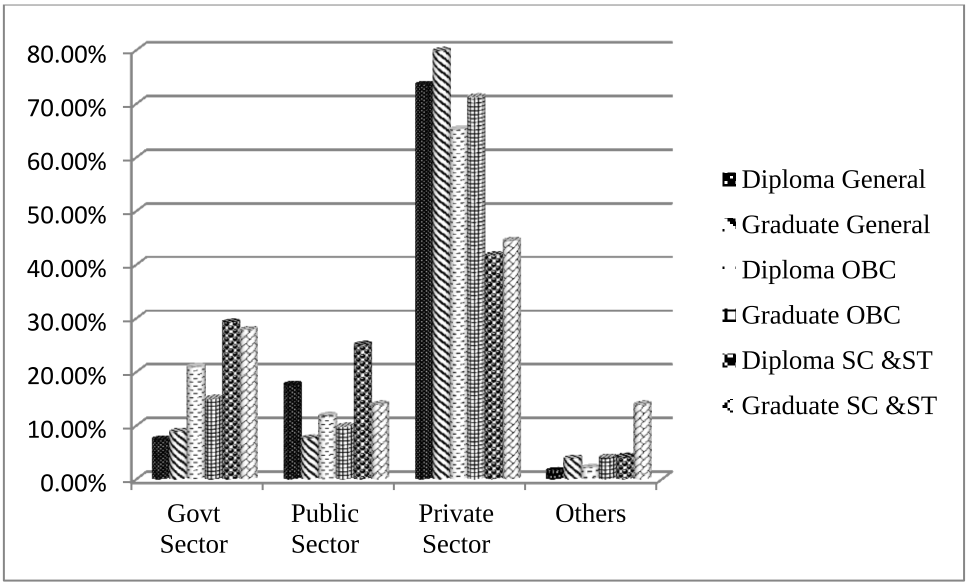

Figure 4.12 Sector of Employment of the Diploma and Graduate Engineers among Different Social Groups

The possibility of getting employment among the engineers belonging to the scheduled caste and scheduled tribes has helped much in arresting the worsening condition of unemployment among the backward classes.

4.4.3.4 Sector of Employment of the Engineers of Kerala and Their Type of Institution of Study

The students pursuing their studies in various institutions do not have an equal chance of being employed in all sectors of employment. Having a non-uniform and uneven distribution in infrastructure, academic environment and placement facilities among the various institutions of study the institutional efforts in providing employment to the aspiring candidates through proactive placements is more prevalent among some of the institutions. The others seldom care to provide employment for the passed engineers leaving it to the choice of the students and market in search for employment in the labour market. How the differences among the institutions based on the characteristics of the ownership of the institutions had influenced the employment chances of engineers among the diploma and graduate engineers is discussed below.

The data shows that the diploma engineers have received jobs more in the private sector, irrespective of the type of institution of their study. This is because the engineers from government colleges, private aided colleges and private unaided colleges are occupied in private sector with 63.9 per cent, 62.2 per cent and 100 per cent respectively.

Table 4.27 Sector of Employment of Diploma and Graduate Engineers and the Type of Institution of Study

Course of Study and Type of Institution	Govt Sector		Public sector		Private sector		Others		Total
	No.	%	No.	%	No.	%	No.	%	
Diploma engineers									
Govt College	42	18.3	35	15.2	147	63.9	6	2.6	230
Private Aided College	9	24.3	5	13.5	23	62.2	0	-	37
Private Unaided College	0	-	0	-	12	100.0	0	-	12
Graduate engineers									
Govt College	54	15.4	38	10.8	241	68.7	18	5.1	351
Private Aided College	9	10.8	14	16.9	57	68.7	3	3.6	83
Private Unaided College	31	9.5	15	4.6	267	82.2	12	3.7	325
Total	145	14.0	107	10.3	747	72.0	39	3.7	1038

Source: Field survey

In government and private aided colleges the government and public sector are the other major employment providers. Within these sectors the students of private aided colleges are relatively more employed in the government sector, whereas the students of government colleges are relatively more employed in the public sector. However it is found that no diploma engineers from the private unaided colleges are working in sectors other than the private sector.

The data for the graduate engineers reveals that of the total employed, again irrespective of the type of institution, more employment is provided in the private sector, with 68.7 per cent of the total employed working in the private sector among the engineers from both the government colleges and private aided colleges. Among the students of private unaided colleges 82.2 per cent are working in the private sector. In the government sector the relative strength of students from government colleges is high whereas in the public sector the relative strength of students from private aided colleges is high.

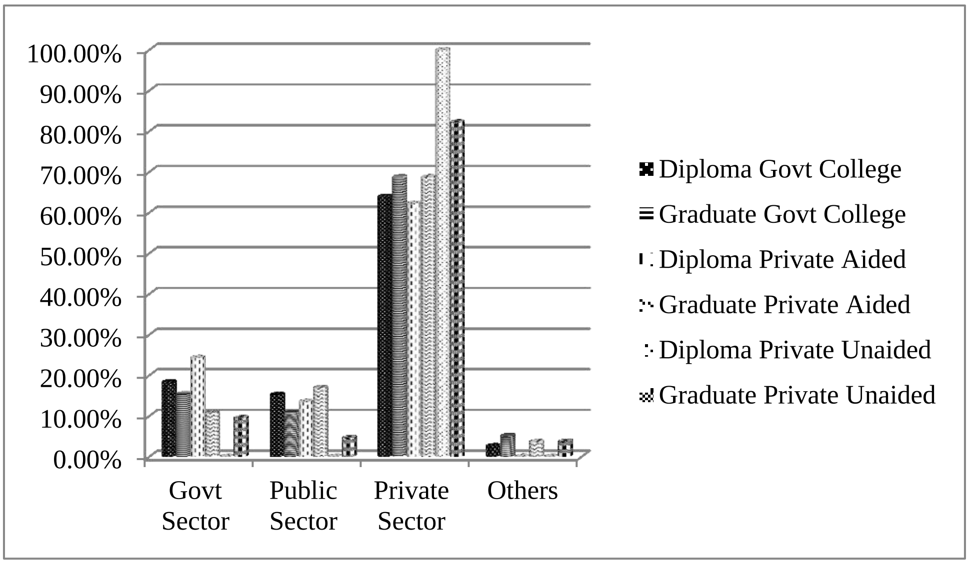

Figure 4.13 Sector of Employment of the Diploma and Graduate Engineers and the Type of Institution of Study

The absence of the government and public sector employment among the unaided colleges shows the least preference by these agencies for the engineers passing from the private unaided institutions or otherwise the failure of the engineers from these institutions to get a job in the government and public sector.

4.4.4 Sector of Employment of the Diploma and Graduate Engineers: Inferential Analysis of the Primary Data

The influence of the characteristics of each variable in getting employment in a particular sector among the diploma and graduate engineers is tested through the chi- square test and the result is given in the table 4.28

Table 4.28 Employment Sector of the Diploma and Graduate Engineers: Inferential Analysis

Course of Study	Characteristics	Category	Chi-square Value	df	Sig.
Diploma	Sector of Employment	Branch	95.456	24	.000***
Graduate B. Tech.	Sector of Employment	Branch	53.825	18	.000***
Diploma	Sector of Employment	Gender	2.424	3	.489
Graduate	Sector of Employment	Gender	20.320	3	.000***
Diploma	Sector of Employment	Social Category	13.323	6	.038**
Graduate	Sector of Employment	Social Category	29.256	6	.000***
Diploma	Sector of Employment	Type of Institution	8.412	6	.209
Graduate	Sector of Employment	Type of Institution	24.493	6	.000***

***significant at 1% level, **significant at 5% level and * significant at 10%level

The table 4.28 shows that the branch of study and the social category of the students have a significant influence on determining the sector of employment both among the diploma and graduate engineers. The gender characteristics and type of institution of study have an influence in determining the sector of employment only at the graduate level.

4.5 Means of Getting Employment among the Diploma and Graduate Engineers in Kerala

The employment profile of an individual is also influenced to a large extent by the prevalence of various means of getting employment. The dynamics existing in the means of getting employment over the period also influences the rate of employment and unemployment existing in an economy. The role of each means of getting employment of any employed person is unduly affected by various economic and non-economic factors such as the economic system prevailing, the economic policies pursued, the existing condition of the economy, the role assigned to each sector of the economy, the structure of the economy, the social attitude towards job, individual preferences, the academic qualification acquired by individuals particularly the course of study undergone, etc.

Considering the sector of employment as a major factor in determining the means of getting employment it is observed that the means of getting employment has undergone drastic changes in India, particularly during the period of post economic reform. The increasing role of private sector with submissive public sector influence on GDP and employment has been thriving since 1990s. The private and public sector pursue entirely different employment policies as their objectives of employment are distinct. The public sector governed by social commitments undertakes more social responsibilities in employment whereas the private sector employment is more merit oriented and hence employment is limited to those with proven ability tested on the basis of their academic achievements or other criteria of absorption during recruitment.

It is also found that within the private sector the objectives of employment vary. For instance in the General Motors Company of the USA, the core of the recruitment policy in the careful selection and placement of employees was to make sure that they are physically mentally and temperamentally fitted to the jobs they are expected to do; to make sure also that new employees can reasonably be expected to develop into desirable employees, and so that the number of square pegs in round holes will be minimised. This indicates the importance attributed to the process of selection, induction, training, placement, etc. of the Corporation's employees. The importance attached to placement for good selection is very high. A wrong placement can mar all the gains of a good selection. Good selection in itself implies that care has been taken to select a person with attributes which match the requirements of a specified job. After such matching of the need and the selection, if placement is given in a different job it can lead to a total disruption of work entrusted to him as well as the very existence of the individual in the organization. The problem of a square peg in the round hole is a very old one[17].

The organizations, therefore, scarcely leave any chance of making good selection for their growth. With this intention of good selection, recruitment is made from different sources of supply of manpower. There are two basic sources of supply of manpower: Internal and External.

[17] George, C. N. (1977). *Personnel Management.* Kochi: N C Sebastian, FACT.

Internal sources include personnel already on the pay roll of the organization as also those who were on the pay-roll of the company but who plan to return, or whom the company would like to rehire. These include those who quit voluntarily or those on production lay-offs.

External sources are outside the organization, like the new entrants to the labour force without experience, including college students, the unemployed with a wider range of skills and abilities, the retired experienced persons, and others not in the labour force, like married women. For the external source of the supply of manpower there are various methods of recruitment. All the methods of recruitment can be put into three categories:

1) Direct Methods that include sending recruiters to educational and professional institutions, employee contacts with public, manned exhibits and waiting lists.

2) Indirect Methods that cover advertising in newspapers, on the radio, in trade and professional journals, technical journals and brochures.

3) Third party methods: Various agencies are used for recruitment under these methods. These include commercial and private employment agencies, state agencies, placement offices of schools, colleges and professional associations, recruiting firms, management consulting firms, indoctrination seminars for college professors, friends and relatives.

Among these various methods, some methods of recruitment are popular and others are not so popular. Similarly there is a great transition in the importance attached to each method of recruitment over a period of time based on the nature of the organization and also on the objective of the firm. The conventional method of getting employment through employment exchange was popular when government played the major role as the employer but now it has lost its significance with campus placement, internet placements and service providers gaining more popularity.

The dynamism in the engineering labour market is such that the engineers belonging to various branches of study are absorbed in firms and industries whose recruitment policies affect the demand for these engineers. Among the engineers belonging to diploma and graduates, the means of getting employment differ either due to the fact that some groups are blessed with more opportunities of higher demand than others and there are incidents of reluctance of accepting employment by the engineers obtained through some other means. To what extent the means of getting employment hold their significance if the engineers are classified on the basis of their branches of study, the gender characteristics, the social category of the engineers, the type of institution of their study, etc., is analyzed and attempt is made to throw light on the degree of importance of the various means of getting employment in providing employment to the engineers. Considering the present conditions existing in the engineering labour market, the major sources of employment are campus and off campus placement, direct application, the public service commission, employment exchanges, newspaper or print media, website or internet placement, service providers and manpower consultants.

4.5.1 Means of Getting Employment Among the Engineers: Descriptive Analysis of the Secondary Data

The different means through which the engineers are absorbed in employment is examined based on the secondary data. The changes in the strength of the means of getting employment over the period will help us in understanding the role of each means. With the induction of new types of colleges after the period of 2001, the institutions are competing among themselves to ensure maximum employment with the help of placement to the job seeking engineers.

The table shows the means of getting employment among both the diploma and graduate engineers.

Table 4.29 Means of Getting Employment among the Diploma Engineers (in%)

Year	Means of Getting Employment (%)				
	Employment Exchange	Public Service Commission	Direct Application	Placement and Training	Others
1986	9.00	10.00	69.00	6.00	6.00
1987	5.60	5.00	74.40	7.50	7.50
1988	12.10	4.30	71.40	3.60	8.60
1989	12.40	9.50	68.40	3.50	6.20
1993	7.80	4.10	83.40	3.80	0.90
1997	3.00	0.80	81.50	4.80	10.00
1999	5.10	1.30	73.90	6.20	13.40
2000	3.00	0.40	79.80	4.40	12.40
2001	2.80	1.20	75.50	4.50	16.30
2002	2.70	1.20	77.70	7.10	11.20
2003	1.30	1.00	71.90	8.40	17.40
2004	0.70	1.70	75.60	9.50	12.60
2005	0.70	1.70	75.60	9.50	12.60
2006	0.80	1.10	69.80	11.50	16.80
2007	1.10	2.30	70.00	8.90	17.60
2008	0.00	4.40	61.00	30.61	0.00
Average	4.26	3.13	73.68	8.11	10.59

Source: Annual Technical Manpower Review, Kerala, NTMIS reports for various years

The data of the diploma engineers shows that direct application is the major means of getting employment. The scope of the placement and training as the means of getting employment among the diploma level is very limited compared to the graduate engineers.

Table 4.30 Means of Getting Employment among the Graduate Engineers (in %)

Year	Means of Getting Employment (%)				
	Employment Exchange	Public Service Commission	Direct Application	Placement and Training	Others
1986	7.00	8.00	75.00	4.00	6.00
1987	3.50	2.30	82.40	7.50	4.20
1988	4.70	6.50	78.70	5.40	4.70
1989	4.20	4.40	81.20	5.10	5.00
1993	4.70	3.10	86.10	5.40	0.70
1997	1.80	1.10	84.90	7.00	5.20
1999	1.70	0.60	76.50	14.50	6.80
2000	1.10	0.40	76.50	14.00	8.00
2001	1.40	0.30	74.10	15.80	8.50
2002	0.50	0.80	71.50	22.30	4.90
2003	7.10	8.80	46.50	32.20	5.40
2004	0.13	0.80	54.47	34.52	10.08
2005	0.13	0.80	54.47	34.52	10.08
2006	0.00	0.80	72.80	19.90	6.40
2007	0.00	0.00	68.60	23.00	7.38
2008	0.00	0.07	45.44	54.00	0.47
Average	2.37	2.42	70.57	18.70	5.86

Source: Annual Technical Manpower Review, Kerala, NTMIS reports for various years

The data about the means of getting employment among the graduate engineers however, shows that direct application is again the major means of getting employment. At the same time, placement and training is now considered important as the scope of getting employment through this means is increasing yearly among the graduate engineers.

4.5.2 Means of Getting Employment of Diploma and Graduate Engineers: Descriptive Analysis of the Primary Data

Among the various means of getting employment the present study takes into consideration the following means of getting employment and they are broadly classified into

1) Employment obtained through Employment Exchanges,
2) Employment obtained through the Public Service Commission,
3) Employment obtained through direct application by the employee,
4) Employment obtained through campus or off campus placement,
5) Others including newspaper/print media, website or internet placement, service providers, manpower consultants and other unmentioned sources.

4.5.2.1 Means of Getting Employment of the Engineers in Kerala and Their Branch of Study

Means of getting employment of the diploma engineers and their branch of study: The means of getting employment for the diploma engineers would be entirely different from those of the graduate engineers because unlike the graduate engineers, the diploma engineers are not blessed with campus and off campus placement. This is because the diploma engineers who are expected to work in the capacity more as supervisors or junior level have less scope of employment through campus placement. Similarly with the low profile associated with the diploma course due to redundant manpower of the graduate engineers, the placement options available for a diploma engineer are fewer.

The table 4.31 given shows the means of getting employment for the diploma engineers in Kerala across various branches of their study. Among the various means of getting employment the sources are classified as employment exchange, the public service commission, direct application, and campus or off campus placements and the remaining are categorized as others.

The table reveals that among the diploma engineers the employment obtained through direct application is the major source of getting employment with 91.4 per cent of the employed diploma engineers finding their employment through the direct application. The next important source of getting employment is through the campus or off campus placement where 4.7 per cent of the engineers are employed through this means and further classification of the means of getting employment into newspaper or print media, internet, service providers and manpower consultants holds irrelevance because of miniscule representation and, therefore, they are put together as other sources.

Table 4.31 Means of Getting Employment of the Diploma Engineers and Their Branch of Study

Branch of Study	Employment Exchange		Public Service Commission		Direct Application		Campus or Off campus Placement		Others		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Civil, Architecture and related branches	2	4.8	0	-	40	95.2	0	-	0	-	42
Commercial Practice	0	-	0	-	10	100.0	0	-	0	-	10
Computer Engineering	0	-	0	-	35	92.1	2	5.3	1	2.6	38
CABM,CHM, and I T	0	-	0	-	19	95.0	1	5.0	0	-	20
Electrical	3	9.1	0	-	27	81.8	1	3.0	2	6.1	33
Electronics and Applied Electronics	0	-	0	-	31	88.6	2	5.7	2	5.7	35
E&C and other related branch	0	-	0	-	17	100.0	0	-	0	-	17
Mechanical	0	-	0	-	33	84.6	6	15.4	0	-	39
Others	0	-	1	2.2	43	95.6	1	2.2	0	-	45
Total	5	1.8	1	0.4	255	91.4	13	4.7	5	1.8	279

Source: Field survey

Means of Getting Employment of Graduate Engineers and Their Branch of Study

It is now observed that there is a sudden spurt in the demand for engineering education because of the widespread faith of the general public on campus placement as the source of getting employment even if there are ups and downs in this type of recruitment due to changes in the macro economic conditions. The new perception of ranking institutions based on the magnitude of the number of companies visiting for placement is widely evident and hence they compete to bring a large number of companies to the institutions to ensure maximum placement. Thus compared to the diploma engineers, it is observed that the campus placements are relatively high among the graduate engineers. The extent to which each means of getting employment among the graduate engineers holds significance in determining their employment status is discussed and is shown in the table 4.32

Table 4.32 Means of Getting Employment of the Graduate Engineers and Their Branch of Study

Branch of Study	Employment Exchange		Public Service Commission		Direct Application		Campus or Off campus placement		Others		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Civil and Architecture	1	1.7	2	3.4	50	84.7	3	5.1	3	5.1	59
Computer Science	0	-	2	1.5	66	49.3	41	30.6	25	18.7	134
Electrical and Electronics	2	1.5	0	-	79	58.1	31	22.8	24	17.6	136
Electronics and Communication	1	0.6	0	-	115	68.9	50	29.9	1	0.6	167
Information Technology	0	-	1	1.6	25	39.1	18	28.1	20	31.2	64
Mechanical	2	1.9	0	-	71	66.4	24	22.4	10	9.3	107
Others	1	1.1	0	-	60	65.2	21	22.8	10	10.9	92
Total	7	0.9	5	0.7	466	61.4	188	24.8	93	12.3	759

Source: Field survey

The table shows that the greatest means of getting employment among the graduate engineers is also through direct application where 61.4 per cent of the employed are absorbed. The next important means of getting employment is the campus or off campus placements with 24.8 per cent of employment absorption. It is also to be observed that both among the diploma and graduate engineers, employment exchanges and public service commissions are not good sources of employment because only less number of aspirants is placed in employment through these means. This is substantiated by the fact that only 0.9 per cent and 0.7 per cent of employed engineers have been appointed through employment exchanges and public service commissions respectively for finding employment. The source of employment through employment exchanges has lost its significance because the job is not permanent in nature and already placed students are reluctant to take appointments obtained through employment exchanges. The growing popularity of the employment among the engineers for private sector job over public and government sector jobs has further resulted in the less demand for jobs obtained through employment exchanges. The other source of employment mainly newspaper, print media, manpower consultants, website or internet placement, service providers also provide employment but only to 12.3 per cent of the job seekers among the graduate engineers.

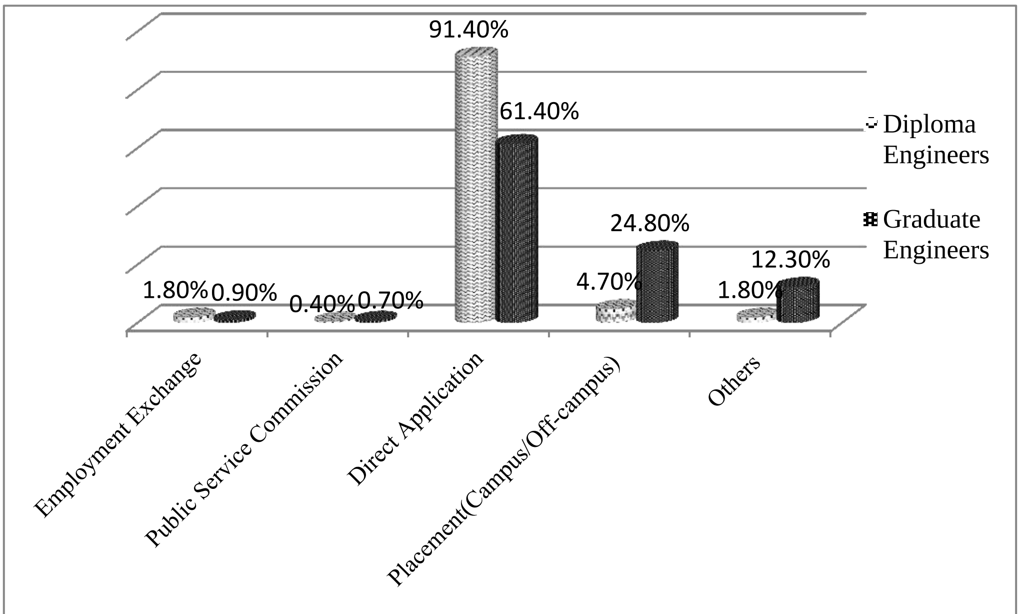

Figure 4.14 Means of Getting Employment of the Diploma and Graduate Engineers in Kerala

The dominance of direct application as the major source of getting employment makes the other sources of employment irrelevant particularly among the diploma engineers.

4.5.2.2 Means of Getting Employment among the Male and Female Diploma and Graduate Engineers in Kerala

The different means of getting employment classified on the basis of gender characteristics are an attempt to find the extent to which the females are discriminated against in getting employment among both the diploma and graduate engineers. There is a general perception that across all employment sources, females are discriminated against which leads to larger incidence of unemployment among females. This problem would have been graver if larger number of females had chosen engineering as their career choice. However this discrimination stands nullified in the case of the branch of study with a large turnout of females compared to males. For instance in the branch of commercial practice at diploma level, there is larger enrolment and high turnout of female engineers with zero male turnout and, therefore, male female difference is only a superficial argument.

Means of getting employment among the male and female diploma engineers: The strength of each means of getting employment also affects the rate of employment and unemployment among the men and women. It is observed that among the diploma engineers the male employment is greater than female employment and male unemployment is less than female unemployment.

Table 4.33 Means of Getting Employment among the Male and Female Diploma and Graduate Engineers

Gender	Employment Exchange		Public Service Commission		Direct Application		Campus or Off campus Placement		Others		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Diploma engineers											
Male	5	2.6	1	0.5	168	88.9	11	5.8	4	2.1	189
Female	0	-	0	-	87	96.7	2	2.2	1	1.1	90
Graduate engineers											
Male	5	1.1	1	0.2	281	63.1	110	24.7	48	10.8	445
Female	2	0.6	4	1.3	185	58.9	78	24.8	45	14.3	314
Total	12	1.2	6	0.6	721	69.5	201	19.3	98	9.4	1038

Source: Field survey

The data of the means of getting employment among the male and female diploma engineers however shows that the females are privileged to get employment mainly through direct application compared to males but in all other means of getting employment, the males enjoy greater advantage than their female counterparts even if the difference is only marginal.

Means of getting employment among the male and female graduate engineers: The conditions of employment and unemployment between male and female graduate engineers are not very different from those of the diploma engineers because for all branches among the graduate engineers the employed males are greater than the females. The male unemployed is also less than the female unemployed.

The data for the graduate engineers also shows that among both the male and female graduate engineers the greatest chunk of the employed depends on the direct application for employment. The number of female engineers getting employment through other means is also abysmally low except through the campus or off campus placement which is the next best important means of getting employment for females. The data also shows that for female engineer's employment obtained through the public service commission, campus placement and other sources is relatively good compared to male graduate engineers.

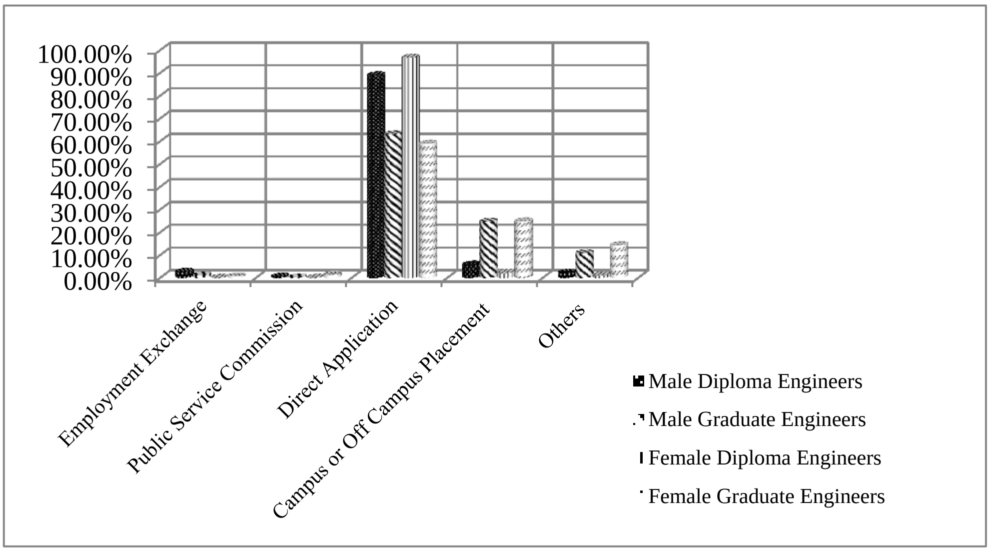

Figure 4.15 Means of Getting Employment for Male, Female Diploma and Graduate Engineers

The means of getting employment other than direct application is more or less absent thereby nullifying the importance of all other sources of getting employment.

4.5.2.3 Means of Getting Employment of the Engineers in Kerala and Their Social Category

The engineers both at the diploma and graduate level hail from different social backgrounds and the means of getting employment is also likely to be influenced by the social background of the engineers. In the government sector and the public sector the recruitments are such that the socially backward students are also considered for appointment through reservations in jobs. Hence appointments made by the public service commissions and employment exchanges will definitely represent the large number of engineers from the socially backward classes.

The extent to which the different means of getting employment influence the employability of the engineers across the various social categories is examined and discussed below.

Means of getting employment of the diploma engineers and their social category

Among the diploma engineers it is found that for all the social categories of engineers direct application is the highest means of getting employment and the other means of getting employment are too marginal to show any significant influence.

Table 4.34 Means of Getting Employment among the Diploma and Graduate Engineers and Their Social Category

Gender	Employment Exchange		Public Service Commission		Direct Application		Campus or Off campus Placement		Others		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Diploma Engineers											
General Category	0	-	0	-	61	89.7	6	8.8	1	1.5	68
OBC	4	2.1	1	0.5	172	92.0	7	3.7	3	1.6	187
SC & ST	1	4.2	0	-	22	91.7	0	-	1	4.2	24
Graduate Engineers											
General Category	3	0.8	2	0.5	222	55.9	118	29.7	52	13.1	397
OBC	3	0.9	3	0.9	214	65.6	67	20.6	39	12.0	326
SC & ST	1	2.8	0	-	30	83.3	3	8.3	2	5.6	36
Total	12	1.2	6	0.6	721	69.5	201	19.3	98	9.4	1038

Source: Field survey

Means of getting employment of the graduate engineers and their social category: Among the graduate engineers also it is again found that direct application is the largest means of getting employment; but unlike the diploma engineers the means of getting employment other than direct application has a role in determining the prospects of employment. For instance through campus and off campus placements and other means, the general category students are privileged to get larger employment.

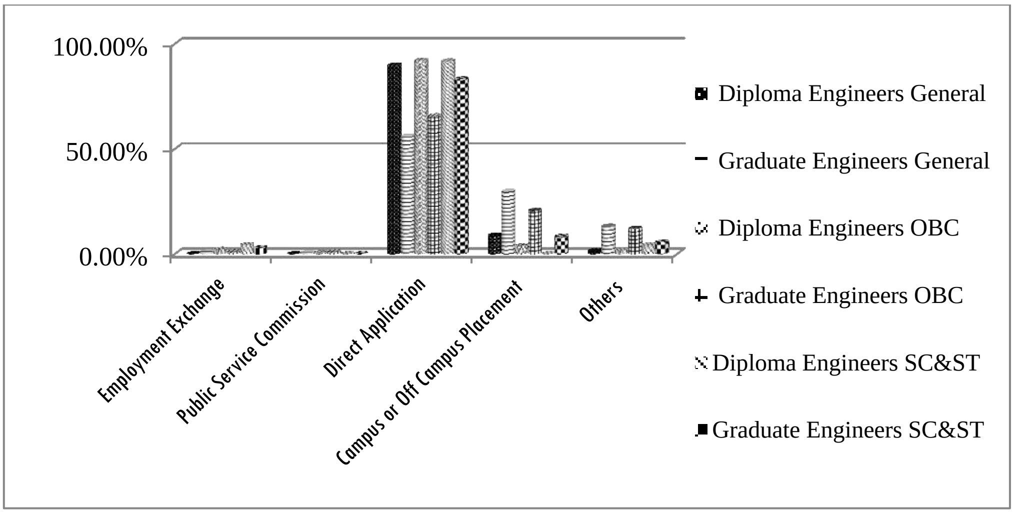

Figure 4.16 Means of Getting Employment among the Diploma and Graduate Engineers and Their Social Category

The uneven distribution of the source and means of getting employment across the various social categories of engineers reveals the fact that employee’s social background still has a dominant role to play in determining the employability of the job seeking engineers.

4.5.2.4 Means of Getting Employment of the Engineers in Kerala and the Type of Institution of Study

The different institutions classified on the basis of the type of management are likely to be influenced by the strength of each means of getting employment.

As the competition among the institutions becomes acute, each of them tries to maximize their academic outcome and also the prospects of employment by maximizing the placement of the passed engineers from their respective institutions. The institutional classifications are such that some are privately owned enjoying greater autonomy in administration which helps in creating an environment necessary for the academic growth of the students. On the other hand the government owned institutions are facing a crunch in resources and are at lesser advantage in terms of resources and autonomy. But the government institutions are, however, privileged to get more meritorious students because of the peculiarities in admission and preference of the students for government colleges.

It is observed that irrespective of the type of institution the passed engineers do not meet the required standards as demanded by the industry in their level of knowledge. In the era of globalization the technical manpower requirement of the industry has changed and it is realized that the graduates of the various portal of the technical institutions are not compatible with the industry expectations due to the lack of exposure to the latest managerial and technical aspects. The industries often express their anguish over the incompetency of the technical institutions in producing the professionals capable of meeting the challenges ahead. Under the impact of ever changing and emerging technologies the role of technical education finds greater responsibility of creating adequate number of technically trained personnel (Talawar,2005)[18]. The recruitment policy of the industry is such that the repute of the institution is the major matter of consideration in appointments.

[18] Talawar, N. M. (2005). Impact of Globalisation on Manpower Planning in Technical Education. In M. K. Sudhir Reddy (Ed.), *Globalisation and Manpower Planning* (pp. 171-178). New Delhi: Discovery Publishing House.

Means of getting employment of the diploma engineers and the type of institution of study

The data on the means of getting employment of diploma engineers based on their institutional characteristics reveals that for all type of institutions, the students are appointed mainly through direct application. The campus placement as the means of getting employment is not at all significant for the diploma course with only a paltry number of students getting employment through this means. The Public Service Commission is again considered to be the smallest source of employment if classified on the basis of the above characteristics.

Table 4.35 Means of Getting Employment of Diploma Engineers and Their Type of Institution

Type of Institution	Employment Exchange		Public Service Commission		Direct Application		Campus or Off campus placement		Others		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	
Diploma Engineers											
Govt College	3	1.3	1	0.4	211	91.7	12	5.2	3	1.3	230
Private Aided College	2	5.4	0	-	32	86.5	1	2.7	2	5.4	37
Private Unaided College	0	-	0	-	12	100	0	-	0	-	12
Graduate Engineers											
Govt College	3	0.9	4	1.1	208	59.3	94	26.8	42	12.0	351
Private Aided College	1	1.2	1	1.2	57	68.7	21	25.3	3	3.6	83
Private Unaided College	3	0.9	0	-	201	61.8	73	22.5	48	14.8	325
Total	12	1.2	6	0.6	721	69.5	201	19.3	98	9.4	1038

Source: Field survey

Means of getting employment of the graduate engineers and the type of institution of study:

For graduate engineers the data again shows that direct application is the greatest means of getting employment for all the types of institution. Campus placement is the next other important means of getting employment and is relatively more in government colleges with 26.8 per cent of employment obtained through this means. In the private aided colleges 25.3 per cent of employment is obtained through placements, whereas in private unaided colleges 22.5 per cent of employment is obtained through this means.

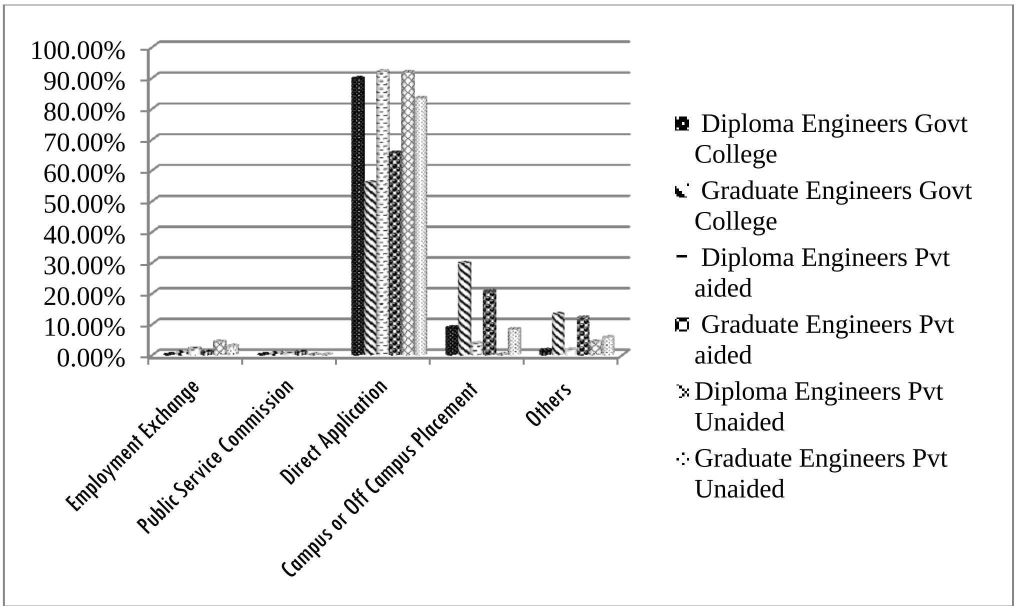

Figure 4.17 Means of Getting Employment among the Engineers and the Type of Institution

Among the various means of getting employment the engineers in the present employment are mainly employed that is obtained through direct application and a few obtaining employment through campus or off campus placements. Thus the other source of getting employment is insignificant because only miniscule numbers of engineers are in employment that is obtained through other sources.

4.5.3 Means of Getting Employment among the Diploma and Graduate Engineers in Kerala- Inferential Analysis of the Primary Data

The various means of getting employment being influenced by various factors are subject to an analysis of chi-square test to examine the strength of each factor in determining the chance of being employed. The table 4.36 shows the chi-square results of the means of getting employment among the diploma and graduate engineers.

Table 4.36 Means of Getting Employment among the Diploma and Graduate Engineers: Inferential Statistics

Course of Study	Characteristics	Category	Chi-square Value	df	Sig.
Diploma	Means of getting employment	Branch	45.025	32	.063*
Graduate B.Tech.	Means of getting employment	Branch	94.348	24	.000***
Diploma	Means of getting employment	Gender	5.298	4	0.258
Graduate	Means of getting employment	Gender	5.974	4	0.201
Diploma	Means of getting employment	Social Category	7.436	8	0.490
Graduate	Means of getting employment	Social Category	19.675	8	0.012**
Diploma	Means of getting employment	Type of Institution	7.859	8	0.447
Graduate	Means of getting employment	Type of Institution	12.865	8	0.117
Diploma	Means of getting employment	Region of Institution	7.856	8	0.448
Graduate	Means of getting employment	Region of Institution	5.959	8	0.652

***significant at 1% level,**significant at 5% level, *significant at 10% level

The above table shows that the branch of study is the only factor that has a significant influence on the means of getting employment both among the diploma and graduate engineers, whereas the social category has an influence on the means of getting employment only among the graduate engineers.

4.6 Job Satisfaction from Employment of the Diploma and Graduate Engineers of Kerala

A job is defined as a collection or aggregation of tasks, duties and responsibilities that as a whole are regarded as the reasonable assignment to an individual employee. A job may include many positions, for a position is a job performed by and hence related to a particular employee. Thus, an employee has his position, but many positions may involve the same assignment of duties and constitute a single job. The job is impersonal: the position is personal[19].

The job performed by an individual is the means to an end. It is performed either as a means of livelihood or is compulsive. The other reason for a person to be in job is intended for the creation of values both material and immaterial where the inspirations achieved from the mental satisfaction force him to be in job, popularly known as the job satisfaction.

Job satisfaction is determined by a set of personal and job factors. Personal factors relate to worker's age, length of service, intelligence, skill and other personality or temperamental factors. R Hoppock mentions six factors as major determinants of job satisfaction, namely

- The manner in which the individual reacts to unpleasant situations
- The facility with which he adjusts himself to other persons

[19] Paramahamsa, R. K. (1991). *Human Resource Management.* Bangalore: Newport University.

- His relative status in the social and economic group with which he identifies himself
- The nature of work in relation to the man's abilities, interests and training
- Security
- Loyalty.[20]

From real experiences it is found that satisfaction from job is one of the important constituent motivating the worker or an employee to continue in his work and hence is also a factor influencing the choice of career of individuals. An individual decides to choose a profession anticipating a level of satisfaction based on his own judgments and evaluation.

Engineering as a profession has gained its popularity due to a high level of job satisfaction obtained by the employed engineers and such is shared with the aspirants. Though individual taste and preferences differ, the overall satisfaction derived from the job is a source of motivation for an individual to continue in their profession but the extent to which the factors that determine the strength of job satisfaction is a matter of interest. Vidushi (2012) has identified factors related to job satisfaction that includes personal factors, social factors, economic factors, self esteem factors and factors that are directly related with job. Among the determinants of the conditions directly influencing job are working conditions, technology, level of occupation, responsibility, job and its expectation, opportunity for advancement, benefits and rewards, job content and context[21].

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[20] Ibid

[21] Vidushi. (2012). *A Study of Job Satisfaction among the Teachers of Professional Institutions.* Rohtak: Ph.D Thesis, M D University.

The engineering profession considering its nature and hierarchy of work is likely to set its own standards of satisfaction with difference based on some characteristics. Elzbieta (1987) observes that engineers do not see interaction with people as a source of satisfaction or dissatisfaction in practice but definitely require people to acquire prestige and respect in their profession. They reported that such issues as high regard by colleagues, high social standing, high regard by clients, helping people, service to the community, or public image of the profession is very important and contributed to their satisfaction with engineering as a profession[22].

Here an attempt is, therefore, made to test the branch wise difference, gender-wise difference, social category-wise difference and institutional type difference in the level of job satisfaction among the employed diploma and graduate engineers of Kerala.

The job satisfaction of the employed engineers is measured using three point likertscale where the level of satisfaction is classified into highly satisfied employed engineers, satisfied with the job and not at all satisfied with the job. The difference in the job satisfaction attained by engineers classified on the basis of their branch of study, their gender characteristics, social category, type of institution, the function of employment and the sector of employment is tested for significance using a Kruskal -Wallis test.

4.6.1 Level of Job Satisfaction of the Diploma and Graduate Engineers- Descriptive Analysis of the Primary Data

The level of satisfaction attained by the diploma engineers is analyzed to know the relation between the branch of study and satisfaction from job. In the

[22] Elzbieta, M. T. (1987, November). Complex Measures of Job Satisfaction/Dissatisfaction amomg Professionals. *Social Indicators Research, 19*(4).

post employment condition individual factors leading to satisfaction at professional level are also different and individual differences here play a key role in determining the level of satisfaction.

The interaction with the engineering employed professionals reveals the following common factors that determine their level of job satisfaction:

- The degree of creativity required in a job,
- The rewards and recognition attained from work,
- The working conditions in which a job is undertaken,
- The place of work,
- The type of the presence of the peers in the job,
- The type of the employer.

As these factors are not equally good in all branches the degree of satisfaction attained is also different among the engineers.

4.6.1.1 Level of the Job Satisfaction of the Engineers and Their Branches of Study

The level of satisfaction attained by the diploma and graduate engineers in Kerala, classified on the basis of their branch of study shows that the relative strength of highly satisfied and satisfied is different across the branches of study and is examined below for analysis.

Job satisfaction level of the diploma engineers and their branch of study: It is found that among the diploma engineers the engineers who are highly satisfied with job are the highest in the branch of mechanical and those who are not satisfied with job are the highest among the engineers in the branch of commercial practice.

It is also observed that the relative number of dissatisfied with the present employment is high compared to the satisfied engineers across all the branches of study.

Table 4.37 Level of Job Satisfaction of the Diploma Engineers and Their Branch of Study

Branch of study	Highly Satisfied with the job		Satisfied with the job		Not satisfied with the job		Total
	No.	%	No.	%	No.	%	
Civil, Architecture and related branches	0	-	12	28.6	30	71.4	42
Commercial Practice	0	-	0	-	10	100.0	10
Computer Engineering	0	-	8	21.1	30	78.9	38
CABM,CHM, and I T	0	-	2	10.0	18	90.0	20
Electrical	3	9.1	9	27.3	21	63.6	33
Electronics and Applied Electronics	3	8.6	6	17.1	26	74.3	35
Electronics and Communication and other related	0	-	1	5.9	16	94.1	17
Mechanical	10	25.6	13	33.3	16	41.0	39
Others	3	6.7	12	26.7	30	66.7	45
Total	19	6.8	63	22.6	197	70.6	279

Source: Field survey

Job satisfactions among the graduate engineers and their branch of study

For the graduate engineers the nature of the job is again different from that of the diploma engineers and it is observed that the level of their satisfaction is greater than those of the diploma engineers and their level of dissatisfaction is less.

The table 4.38 for the graduate engineers shows that among the various branches of study the strength of highly satisfied students is relatively high in the branch of Computer Science and Information Technology, whereas the relative strength of the not satisfied is the highest among the engineers in the branch of Mechanical in contrast to the observation found among the diploma engineers. Thus the branch-wise level of satisfaction is uniquely characterised among the diploma and graduate engineers.

It is also observed from the data that like the diploma engineers, the graduate engineers also exhibit large number of dissatisfaction from job when compared with the number of satisfied and highly satisfied, in all the branches of study.

Table 4.38 Level of Job Satisfaction of the Graduate Engineers and Their Branch of Study

Branch of study	Highly Satisfied with the job		Satisfied with the job		Not satisfied with the job		Total
	No.	%	No.	%	No.	%	
Civil and Architecture	24	40.7	9	15.3	26	44.1	59
Computer Science	61	45.5	7	5.2	66	49.3	134
Electrical and Electronics	38	27.9	28	20.6	70	51.5	136
Electronics and Communication	38	22.8	43	25.7	86	51.5	167
Information Technology	27	42.2	3	4.7	34	53.1	64
Mechanical	36	33.6	9	8.4	62	57.9	107
Others	37	40.2	16	17.4	39	42.4	92
Total	261	34.4	115	15.2	383	50.5	759

Source: Field survey

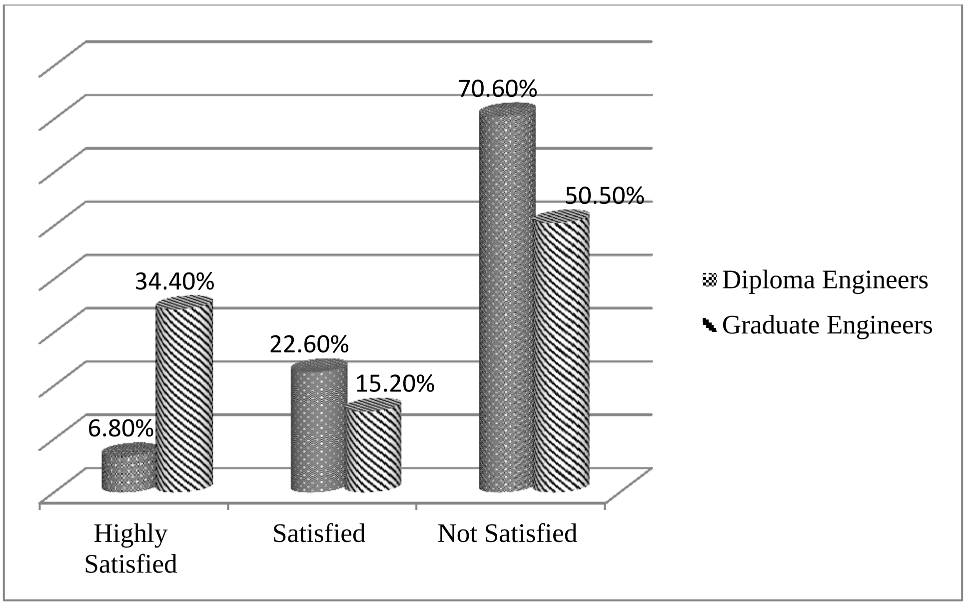

Figure 4.18 Level of Job Satisfaction among the Diploma and Graduate Engineers

The proportion of highly satisfied is relatively high among the graduate engineers whereas the relative number of satisfied and not satisfied is found high among the diploma engineers. This is because there are some qualitative attributes associated with job satisfaction which is more accessible to the graduate engineers whereas the diploma engineers are deprived of them.

4.6.1.2 Level of Job Satisfaction of the Diploma and Graduate Engineers and Their Gender Profile

Owing to some socio-political and cultural factors Indians are caught in a system of orthodoxy where female job, particularly at technical level, was not welcomed and hence enrolments of girls in technical education were dismal till recently. This phenomenon has changed with the female education being a necessary condition for marriage forcing more of the parents to acquire higher level of education (TThankachan2007)[23]. The growth of the urban middle class has further added as an impetus to this phenomenal growth leading also to the expansion of female enrolment in technical education. The rapid advancements in technology and impact of globalization and privatization have brought significant changes in the labour market scenario witnessed by the growing demand for female labour faster than in the past, offering wider occupation to women entering the labour market in the near future (Despande, Sudha 1992)[24]. The Economist reports that the future of the world economy lies increasingly in female hands and women are now the most powerful engine of global growth. The article 'Women and World Economy: A Guide to Womenomics, reports that the rise in female employment has accounted for a big chunk of Global Growth. "Back of the envelope calculations suggest that the employment of extra women had not only added more to the GDP than new jobs for men but has also chipped in more than either capital investment or increased productivity"[25]. But merely generating employment opportunities does not ensure satisfaction from job and whether the working conditions of women differ from those of their male counterparts can only be tested from the level of satisfaction attained from the job. Among the various personal factors that affect job satisfaction, the sex characteristic is considered to be the important determinant of job satisfaction in most of the studies. The level of job satisfaction across the gender among both the diploma engineers and graduate engineers is discussed below.

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[23] Thankachan, T. (2007). *Women Engineers in Professional Labour Market in India.* New Delhi: IAMR.

[24] Deshpande, Sudha. (1992). Structural Adjustment and Feminisation. In A. S. Singh (Ed.), *Women and Work: Changing Scenario in India.* New Delhi: B R Publications.

[25] Womenomics. (2006, April Sunday). *Times of India,* p. 20.

Among the diploma engineers it is found that the level of dissatisfaction of females is high compared with the males. Hence it implies that even if females are employed, their working conditions are poorer than those of the males, explained by the incidence of higher degree of dissatisfaction possibly due to unfavourable factors that determine the level of satisfaction from work.

For graduate engineers also the females are more dissatisfied, compared to males. But the responses are mixed regarding the degree of satisfaction across gender because the relative strength of merely satisfied female graduate engineers is greater than the male engineers, whereas in the category of the highly satisfied, the male engineers are greater than the females.

Table 4.39 Level of Job Satisfaction of the Diploma and Graduate Engineers and Their Gender Profile

Sex	Highly Satisfied with the job		Satisfied with the job		Not satisfied with the job		Total
	No.	%	No.	%	No.	%	
Diploma Engineers							
Male	18	9.5	56	29.6	115	60.8	189
Female	1	1.1	7	7.8	82	91.1	90
Graduate Engineers							
Male	163	36.6	65	14.6	217	48.8	445
Female	98	31.2	50	15.9	166	52.9	314
Total	280	27.0	178	17.1	580	55.9	1038

Source: Field survey

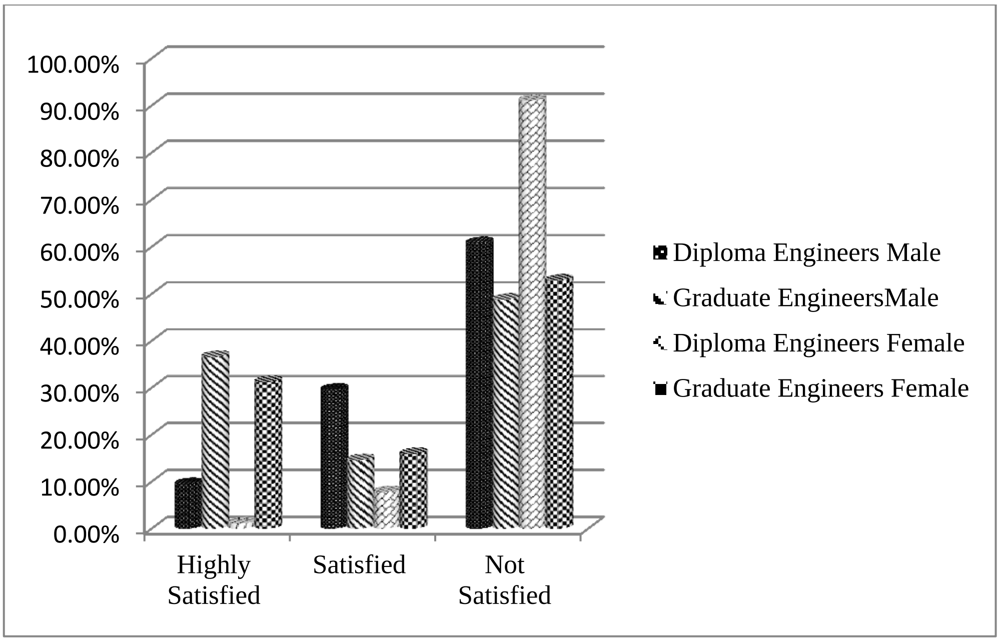

Figure 4.19 Level of Job Satisfaction of the Diploma and Graduate Engineers and Their Gender Characteristic

The high level of dissatisfaction existing among the female engineers along with the low proportion of them in highly satisfied and satisfied category shows that female engineers are discriminated against in the engineering job market.

4.6.1.3 Level of Job Satisfaction of the Diploma and Graduate Engineers and Their Social Profile

Satisfaction being a state of mind, the personal and social factors play their role in determining the degree of satisfaction because job satisfaction is a pleasurable or positive emotional state resulting from the appraisal of one's job experiences. Job satisfaction is regarded as the composite of attitudes of individual employees towards their jobs and relationship they create (Dale

Yoder, 1948)[26]. Since job satisfaction is an emotional response to a job situation it can only be inferred and not seen. Job satisfaction is often determined by how outcomes meet or exceed expectations and job satisfaction represents several related attitudes. Among the factors that determine job satisfaction individual factors and job factors are considered to be the most important and among the individual factors we can see the level of education, intelligence, health, age, interests and family conditions (Purohit Pranay, 2002) [27] where the family conditions have more or less a direct impact of the social attributes attached to a family ruled by the caste and the community factors. The social milieu of an individual provides the ambience that influences the personality traits of individuals and hence the responses to a particular situation even if personal, is also characterized by the existing social factors surrounding an individual. The varied social factors existing in India makes much more complex, the diverse response of individuals to situations, adding further to the existing differences in the level of satisfaction attained from the job due to their social traits. The difference among them is observable even if the acquired level of knowledge gets higher and higher irrespective of the kind of education. The extent to which this has influenced the level of job satisfaction among the engineers is analyzed to examine the strength of social components in determining their job satisfaction level.

The data of the diploma engineers with respect to their job satisfaction reveals that the relative strength of highly satisfied is the highest among the

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[26] Herbert G, Heneman,jr, Harland Fox, and Yoder Dale. (1948). *Patterns of Manpower Mobility* (Vol. 10). Minneapolis: University of Minnesota.

[27] Purohit, P. (2002). *A Sociological Study of Job Satisfaction among Executives and Labourers with Special Reference to Raymond Ltd in Chindwara District.* Bundelkhand: Bundelkhand University.

OBC category. The strength of satisfied is high among the general category and those not satisfied with the job is the highest among the SC and ST engineers. Among the graduate engineers, highly satisfied and merely satisfied with the job are high among the general category engineers, whereas the engineers dissatisfied with the job are high among the other backward classes in contrast to the findings among the diploma engineers where they are highly satisfied. It is also observed that the engineers belonging to scheduled caste and tribe are relatively more satisfied than the other backward classes because their relative strength is more in the category of highly satisfied and merely satisfied.

Table 4.40 Level of Job Satisfaction among the Diploma Engineers and Their Social Category

Social Category	Highly Satisfied with the job		Satisfied with the job		Not satisfied with the job		Total
	No.	%	No.	%	No.	%	
Diploma Engineers							
General Category	3	4.4	22	32.4	43	63.2	68
Other Backward Class	15	8.0	39	20.9	133	71.1	187
SC or ST	1	4.2	2	8.3	21	87.5	24
Graduate Engineers							
General Category	155	39.0	75	18.9	167	42.1	397
Other Backward Class	94	28.8	36	11.0	196	60.1	326
SC or ST	12	33.3	4	11.1	20	55.6	36
Total	280	27.0	178	17.1	580	55.9	1038

Source: Field survey

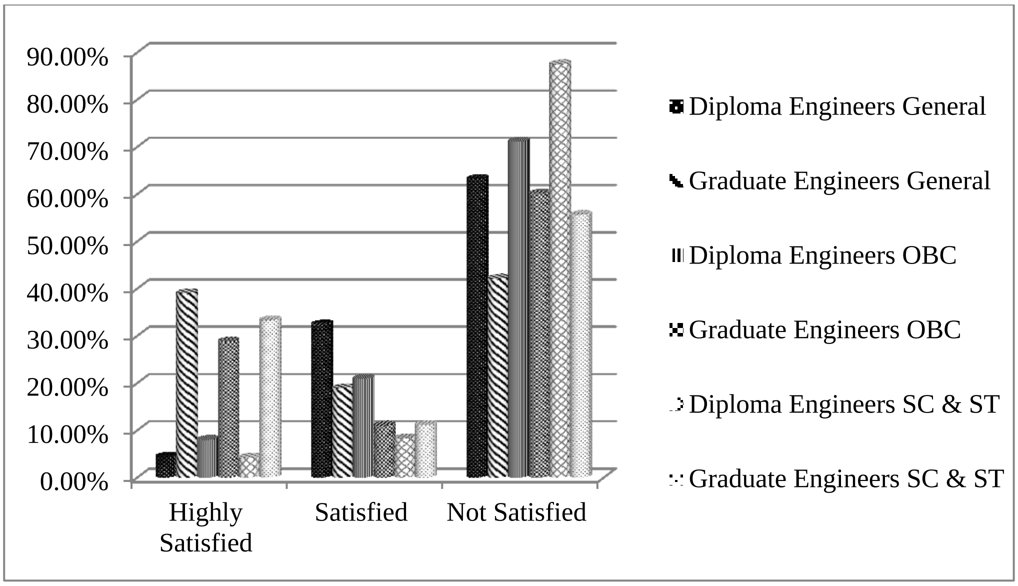

Figure 4.20 Level of Job Satisfaction among the Engineers and Their Social Category

The contrasting observation in the level of the satisfaction among the engineers based on their social category between the diploma and graduate engineers reveals that there is no clear discrimination based on caste in engineering jobs in Kerala. It indicates the higher level of the social equality index in Kerala achieved due to the ideal social practices influenced by the strength of the education system in the state.

4.6.1.4 Level of Job Satisfaction of the Engineers and the Type of Institution of Study

The existence of diversified types of institutions classified on the basis of their management is the characteristic of the engineering education in Kerala. The exercise of option for any college on the basis of their type of management depends on many factors like the quality of faculty, the quality of instruction measured on the basis of the placements and academic achievements, the basic infrastructure facilities available and others. The preference for government colleges and aided colleges of engineering was on account of some merits these institutions had. They enjoy an edge over others in respect of the above favorable conditions. The newly established private unaided colleges failed to be on a par with the reputed institutions. But having a decadal establishment record the present status of many unaided colleges have improved with respect to the infrastructure and quality of faculty and they are positioned enough to compete with the government and aided colleges because they are privileged to get the services of many of the retired faculty from these institutions. Hence qualitative difference among the institutions has narrowed based on the above parameters.

But the undue effect of the uneven distribution in terms of the quality of intake across these institutions reveals some unique trait of job satisfaction among the engineers when compared on the basis of their study in a particular type of the management of the institutions. The job satisfaction level being more or less personal, it is also affected by the type of institution of study. The difference in the concentration of students with particular traits exercised during admission also leads to the concentration of engineers with unique level of job satisfaction obtained from job. Thus the level of job satisfaction attained by the engineers is also analyzed for their type of institution of study. The students after having completed their studies from various institutions classified on the basis of their types of management pursue job either because of interest or due to the satisfaction level expected from job.

With each institution competing hard to maximize the number of employment provided to the aspiring students for increasing the index of the repute of the institution, there is little effort to ensure that the students are placed according to their expectations. The extent to which the level of job satisfaction is attained after employment according to the type of management of the institution is measured here among both the diploma holders and graduate engineers.

The data of the diploma engineers shows that the highly satisfied student is relatively high among the private aided colleges. The students who are merely satisfied are relatively high among the private unaided colleges and the least level of satisfaction is attained by the students from government colleges as the relative number of not satisfied is highest in government colleges. The data for the graduate engineers shows that the highest level of satisfaction is attained by the students from government colleges. The students expressing merely satisfied are relatively high among the engineers of private aided colleges and the number of engineers who are not satisfied with the job is relatively high in private unaided colleges.

Table 4.41 Level of Job Satisfaction among the Diploma and Graduate Engineers and the Type of Institution

Social Category	Highly Satisfied with the job		Satisfied with the job		Not satisfied with the job		Total
	No.	%	No.	%	No.	%	No.
Diploma Engineers							
Govt College	15	6.5	49	21.3	166	72.2	230
Private Aided College	4	10.8	9	24.3	24	64.9	37
Private Unaided College	0	-	5	41.7	7	58.3	12
Graduate Engineers							
Govt College	137	39.0	51	14.5	163	46.4	351
Private Aided College	30	36.1	20	24.1	33	39.8	83
Private Unaided College	94	28.9	44	13.5	187	57.5	325
Total	280	27.0	178	17.1	580	55.9	1038

Source: Field survey

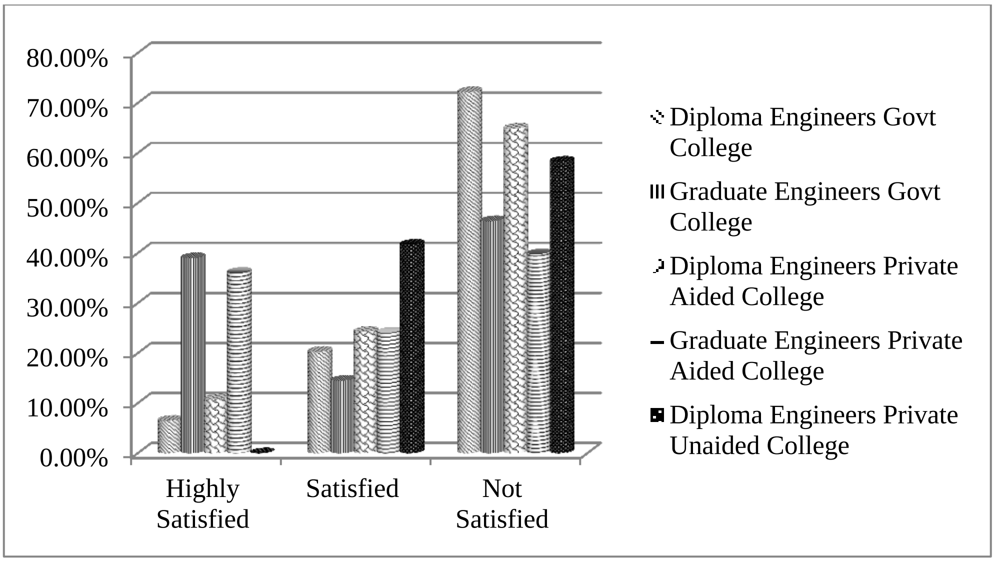

Figure 4.21 Level of Job Satisfaction of the Engineers and Their Type of Institution of Study

The difference in the level of the satisfaction among the engineers from the same type of institution but from different courses shows the varied nature of the quality of education existing between the two courses. The low level of satisfaction attained by the diploma engineers from the government colleges is due to reasons that are not explained by the quality of infrastructure and quality of the faculty as the government colleges are better positioned in this respect. The institutional difference based on the job satisfaction is therefore, nullified.

4.6.1.5 Level of Job Satisfaction of the Engineers and the Employment Function of the Engineers

As examined before it is known that both the diploma and graduate engineers are working either in engineering or other areas of employment. The extent to which the function of the engineers and the level of satisfaction attained from the job is analysed here. The table 4.42 shows the employment function and also the level of satisfaction of the engineers.

Table 4.42 Employment Function of the Engineers and Their Level of Satisfaction

Course of Study	Employment Function	Level of Job satisfaction among the Engineers					
		Highly Satisfied		Satisfied		Not Satisfied	
		No.	%	No.	%	No.	%
Diploma Engineering	Teaching	0	-	3	12.5	21	87.5
	Engineering related services	16	7.5	53	24.8	145	67.8
	Administration /Management	0	-	1	33.3	2	66.7
	Software/ Hardware	0	-	5	45.5	6	54.5
	Clerical/ Office work	3	11.1	1	3.7	23	85.2
	Total	**19**	**6.8**	**63**	**22.6**	**197**	**70.6**
Graduate Engineering	Teaching	28	26.9	6	5.8	70	67.3
	Engineering related services	123	39.7	35	11.3	152	49.0
	Administration /Management	13	40.6	11	34.4	8	25.0
	Software/ Hardware	95	37.0	57	22.2	105	40.9
	Clerical/ Office work	2	3.6	6	10.7	48	85.7
	Total	**261**	**34.4**	**115**	**15.2**	**383**	**50.5**

Source: Field survey

It is observed that the level of the dissatisfaction is high among the diploma engineers and it is high among those who are in teaching job. Thus it implies that the job expectations of the engineers from teaching and satisfaction attained when they are in teaching is observably inconsistent and many of them take teaching job due to compulsions. The clerical job however, gives highest level of satisfaction particularly among those who are in the branch of commercial practice but among the other branches, the clerical job is least preferred and hence also leads to their high rate of dissatisfaction.

Among the graduate engineers, just like the diploma engineers the level of dissatisfaction is high among those who are in the clerical job and also those who are in teaching. Thus it can be concluded that teaching and clerical work among the engineers is not in consonance with the expectations of the engineers which leads to their dissatisfaction. The graduate engineers working in administration and management however are satisfied, even if such jobs are considered to be a diversion from the real profession of engineering.

4.6.1.6 Level of Job Satisfaction of the Engineers and the Sector of Employment of the Engineers

The engineers are employed in various sectors. The general perception of the workers revealing their preference for government jobs is based on the satisfaction attained from jobs in the government owned departments. Similarly there are other categories of employees in large number who prefer working in the private sector because the remuneration and the prospects of career growth are high there. How far this difference in the level of satisfaction exists among the engineers based on their sector of employment is examined here.

Table 4.43 Sector of Employment of the Engineers and Their Level of Satisfaction

Course of Study	Sector of Employment	Level of Job satisfaction among the Engineers					
		Highly Satisfied		Satisfied		Not Satisfied	
		No.	%	No.	%	No.	%
Diploma Engineering	Government Sector	4	7.8	10	19.6	37	72.5
	Public Sector	3	7.5	4	10.0	33	82.5
	Private Sector	12	6.6	48	26.4	122	67.0
	Others	0	-	1	16.7	5	83.3
	Total	19	6.8	63	22.6	197	70.6
Graduate Engineering	Government	21	22.3	5	5.3	68	72.3
	Public Sector	20	29.9	9	13.4	38	56.7
	Private Sector	214	37.9	92	16.3	259	45.8
	Others	6	18.2	9	27.3	18	54.5
	Total	261	34.4	115	15.2	383	50.5

Source: Field survey

The level of job satisfaction attained by the diploma engineers shows that among the engineers their dissatisfaction is much less in the private sector as compared to those in the public, government sector and others. It implies that the attributes associated with job dissatisfaction such as less prospects of career growth and low remuneration is more in the government owned sectors contributing much to the higher dissatisfaction existing among them. At the same time among the graduate engineers, the level of dissatisfaction is highest in the government sector. Here also the dissatisfaction is least in the private sector substantiating the earlier observations as found among the diploma holders. The other important factor that leads to higher dissatisfaction among engineers in the government and public sector is that among the employed, large number of engineers are on contract job and apprenticeship in the government and public sector and hence as expected their dissatisfaction is also high.

If job satisfaction is considered as an index of preference for job by the future job seekers, the talented engineers in future will reveal their definite preference for the private sector job and the efficiency parameters in the government and public sectors will be adversely affected as a result of this.

4.6.2 Level of Job Satisfaction of the Diploma and Graduate Engineers in Kerala: Inferential Analysis of Primary Data

The level of job satisfaction attained by the diploma and graduate engineers when classified on various characteristics reveals that the level of satisfaction is not uniform across all characteristics. The strength of each characteristic on the level of satisfaction is examined based on Kruskal -Wallis test and the summary of the results is given in the table 4.44.

Table 4.44 Level of Job Satisfaction of the Engineers: Inferential Statistics

Course of Study	Characteristics	Category	Kruskal Wallis	df	Sig.
Diploma	Level of job satisfaction	Branch	35.566	8	.000***
Graduate	Level of job satisfaction	Branch	9.729	6	0.137
Diploma	Level of job satisfaction	Gender	26.960	1	.000***
Graduate	Level of job satisfaction	Gender	1.927	1	0.165
Diploma	Level of job satisfaction	Social Category	4.293	2	0.117
Graduate	Level of job satisfaction	Social Category	18.729	2	.000***
Diploma	Level of job satisfaction	Type of Institution	1.501	2	0.472
Graduate	Level of job satisfaction	Type of Institution	11.332	2	.003***
Diploma	Level of Job Satisfaction	Employment Function	10.800	5	.055*
Graduate	Level of Job Satisfaction	Employment Function	49.399	4	.000***
Diploma	Level of Job Satisfaction	Sector of Employment	3.734	3	.292
Graduate	Level of Job Satisfaction	Sector of Employment	21.044	3	.000***

***significant at 1%,** significant at 5% and * significant at 10% level

The table 4.44 shows that the branch of study, the gender profile and the employment function of the engineers have an influence on the level of job satisfaction only at diploma level whereas the social category of the engineers, the type of institution of study, the employment function and the sector of employment have an influence on the level of job satisfaction among the graduate engineers. All other characteristics among the engineers do not have much influence in determining the level of satisfaction or it can be stated that the difference in the level of satisfaction across the other characteristics is statistically insignificant.

The difference in the satisfaction level based on the functions and sector of employment is significant only among the graduates and not among the diploma engineers.

4.7 Monthly Income of the Diploma and Graduate Engineers and the Level of Satisfaction among the Employed Engineers in Kerala

The reward to the factors of production based on their marginal product are the generally propagated doctrines in economic theories. Irrespective of the nature of the profession, the monthly income is associated with the skill and ability the professionals are endowed with. As more and more skill is acquired from education and experience it is assumed that the productive capacity of an individual increases. Hence the remuneration also increases if higher levels of learning are acquired and naturally professionals demand higher wages on the presumption that they are relatively skilled compared to others.

The alternative idea of productive capacity of an individual being determined by the reward of the factor is also accepted in economic doctrines. One view in relation to the nature of people as expressed by Irwing Fisher, the great economist has been that human is an economic man, and therefore, if we wish to motivate employees for better performance, they are to be paid more to satisfy their needs. Based on his observations at the shop floor level, F.W. Taylor has also realized that the energetic employee should be paid at the higher rate than the normal one. Prior to 1932, even Henry Fayol too supported the concept of fair remuneration i:e. remuneration to be paid to the employees up to their satisfaction (Vidushi 2012)[28].The increase in the value of reward to the factor due to higher skill is, therefore, natural.

But with the advancement of technology and adoption of capital based techniques of production in diversified areas of production from agriculture to sophisticated space research, the demand for technical experts has largely enhanced leading to a disproportionate rise in the wages of professionals, particularly in selected areas. The rise in the wages is merely not because of the higher skill but is largely determined by the economic factors of demand supply gap. The existence of the wide difference in wages within the same level of education has left the skill disposition an irrelevant determinant of the factor rewards. For instance the high demand in the software industry at one time has increased the pay and emoluments of software professionals with no corresponding increase in the salaries of the employees or engineers working in the core manufacturing areas during the period. Thus even if the engineers are relatively paid better than non engineers with the same levels of education, they are not equally satisfied across all occupations in which they are engaged and working. Similarly the insatiable condition existing across all the cross sections of the community further leads to dissatisfaction among the engineers. The other probabilities are that the degree of satisfaction attained from the same level of income also varies between individuals. The level of income is therefore a major determinant of satisfaction from job which further is influenced by a large number of other factors like their level of education,

[28] Vidushi. (2012). *A Study of Job Satisfaction among the Teachers of Professional Institutions.* Rohtak: Ph.D Thesis, M D University.

gender characteristics, the social environment in which an individual is bought up, the existing economic conditions, etc.

The positive effect of income and its impact on job satisfaction and productivity has been extensively studied across the cross sections of community including professionals. Shapiro (1973) has observed that pay satisfaction can contribute to our basic understanding of the working condition in areas such as job satisfaction, motivation, organization, commitment, group cohesiveness and social comparison[29]. With the wide difference in pay among the different kinds of jobs the satisfaction in income derived from job also changes. To what extent this difference in the pay exist among the diploma and graduate engineers based on the branches of their study, their gender characteristics, the social category to which they belong, the type of institution of study, etc. is examined and analysed. The mean salary of these engineers is worked out in order to know their mean difference. An 'ANOVA' test is conducted to test the significance of the difference in the mean salary and the degree of satisfaction is also estimated to know the difference among the engineers based on the above characteristics.

4.7.1 Level of Monthly Income of the Diploma and Graduate Engineers and Their Level of Monetary Satisfaction: Descriptive Analysis of the Primary Data

The difference in the level of salary or remuneration offered to the engineers holds importance because it helps in determining whether engineers are discriminated against or not based on the branch of their study. Thus for the same level of education and quality of manpower, variation in the remuneration indicates the unique dynamism in the engineering labour market.

[29] Shapiro, H. J. (1973). Development of a Structural Model of Pay Satisfaction. *Working Paper*. Baruch College: The City University of NewYork.

It is found that the demand for engineers belonging to a particular branch is greater than the demand for engineers in other branches with observable differences in the rate of absorption of the engineers when analyzed over a period of time. But owing to precarious conditions in the engineering labour market it cannot be assured that the branch of study having high demand in the labour market is able to sustain its demand for a long period of time. The real victim of this kind of extreme dynamism in the engineering labour market is the student community. This is because they are most affected by vagaries of time failing to foresee the developments likely to occur in the labour market in future.

If the demand for a particular branch is sluggish due to the fall in its demand in the labour market, the salary offered to the engineers in that particular branch also falls and as a result the debt ridden students are badly affected due to the poor forecast. The fall in the level of income affects their level of income satisfaction which is not uniform across all the branches of study. Hence it becomes necessary to analyze the difference in the level of income and the level of satisfaction from income on the basis of the branch of their study of the diploma and graduate engineers.

4.7.1.1 Level of Income of the Engineers, Their Satisfaction Level and the Branch of Study

The monthly income of the diploma engineers, the level of satisfaction and their branch of study

The monthly salary received among the diploma engineers after their employment is collected and is shown in table 4.45 The data reveals that the average monthly salary of the total diploma engineers is ₹ 8,601 and the average monthly salary is the highest in the branch of mechanical. The lowest salary received is among the engineers in the branch of commercial practice. It is also observed that the standard deviation of the monthly salary of the diploma engineers is high implying that the distribution of income within the branch is uneven.

. **Table 4.45 Branch-wise Monthly Salary of the Diploma Engineers**

Branch of Study	Number	Mean Salary	Standard Deviation
Civil, Architecture and related branches	42	7500.0000	2606.27760
Commercial Practice	10	4690.0000	1137.68771
Computer Engineering	38	7039.4737	3245.33257
CABM, HM and IT	20	6090.0000	2330.32638
Electrical	33	10984.8485	10272.44863
Electronics and Applied Electronics	35	8944.2857	10548.06068
Electronics and Communication and other related	17	5823.5294	1936.01698
Mechanical	39	11953.8462	6250.80400
Others	45	9062.2222	4027.36598
Total	279	8601.2545	6402.13320

Source: Field survey

The wide difference in the level of income observed among the diploma engineers is likely to affect the level of satisfaction of the engineers across the branches of study.

The data also reveals that in total 23.7 per cent of the employed diploma engineers are highly satisfied with their level of income, 20.1 per cent of the employed diploma engineers are merely satisfied with their income and 56.3 per cent of the employed diploma engineers are not satisfied with their level of income (Figure 4.22). The fact thus reveals that more than half of the diploma engineers are not satisfied with their present income.

The monthly income of the graduate engineers, their level of satisfaction and the branch of study: The graduate engineers with a different nature of work and belonging to a higher hierarchy in the job structure as compared to the diploma engineers are endowed with higher learning skill. The graduate engineers, therefore, demand higher reward for their services. But the market conditions are such that they fail to pay engineers on par with the expectations of the engineers resulting in different levels of satisfaction. The difference in income of the graduate engineers across the various branches of study and their monetary satisfaction are also examined.

Table 4.46 Branch-wise Monthly Salary of the Graduate Engineers

Branch of study	Number	Mean Salary	Standard Deviation
Civil and Architecture	59	21228.4746	10311.83799
Computer Science	134	18157.6493	8524.64498
Electrical and Electronics	136	17782.4853	10084.77481
Electronics and Communication	167	18795.3892	9181.58330
Information Technology	64	18154.8750	8717.25499
Mechanical	107	22003.2336	14483.21690
Others	92	24106.1522	14379.18248
Total	759	19732.3808	11076.19071

Source: Field survey

The table 4.46 for the graduate engineers shows that the graduate engineers are earning an average monthly salary of ₹ 19,732 which is high above the average monthly salary of the diploma engineers and among the various branches the engineers belonging to others earn the highest average monthly salary. Considering the branches of study with independent identities the engineers in the branch of the branch of Wood Technology earns the highest average monthly salary at the diploma level whereas at graduate level the engineers in the branch of Naval Architecture and Ship Building earns the highest. But considering the number of the engineers passed the mechanical engineers are also found to be remunerated highly. (Appendix IV Table 4.7.1 and 4.7.2.).

The spurt in the automobile industry in India due to economic liberalization has benefitted the mechanical engineers both at the diploma and graduate level. As a result their monthly income level is high compared to other traditional branches.

The standard deviation of the monthly salary indicates higher differences in income among the graduate engineers just like the diploma engineers substantiating the fact that the distribution of income within the branch of study is not uniform and there are factors other than the branch of their study which influence the quantum of salary fixed for an employee.

But it cannot be assured that the satisfaction level increases merely due to a change in the level of income. There are studies which prove that the pay satisfaction is related to a large number of variables. Much of the research in equity theory is relevant on the prediction that people with higher skills, longer experience, intensive training and increased effort will usually be more dissatisfied with their pay than the other people without these magnified characteristics. These variables would be considered as part of an employee's input. If his outcomes did not increase in the same proportion as his inputs, his outcome/input ratio would decrease. Lawler (1967) [30]predicts that, the higher the educational level of the person, the greater would be the pay dissatisfaction, other things being equal. His view is shared by the work performed by Andrews and Henry (1967)[31], Centers and Cantril (1946)[32], and Klein and Maher (1966)[33], which presents evidence suggesting a negative relationship between education level and pay satisfaction**.** But there are other studies which also indicate that with actual pay being considered, higher pay leads to higher level of satisfaction. Locke (1968)[34], Morse (1953)[35] and Centers and Cantril (1946)[36] therefore found a positive relation between pay and pay satisfaction. To examine the direction of the pay and the income satisfaction that proceeds among the employed engineers in Kerala, their satisfaction level is also analysed.

The level of income satisfaction shows that 31.5 per cent of the employed graduate engineers are highly satisfied with the level of income whereas 19.1 per cent of the employed graduate engineers are merely satisfied with the income level and the 49.4 per cent of the employed graduate engineers are not satisfied with their level of income (Fig. 4.22).

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[30] Lawler, E. E. (1967). The Multitrait-Multitraiter Approach to Measuring Managerial Job Performance. *Journal of Applied Psychology, 51*.

[31] Andrews I R. (1967). Wage Inequality and Job performance : An Experimental Study. *Journal of Applied Psychology, 51*.
Henry, M. M. (1963). Management Attitudes toward Pay. *Industrial Relations, 3*, 29-39.

[32] Centers, R and Cantril, H. (1946). Income Satisfaction and Income Aspiration. *Journal of Abnormal and Social Psychology, 41*, 64-69.

[33] Klein, S M and Maher J R. (1966). Education Level and Satisfaction with Pay. *Personnel Psychology, 50*, 479-486.

[34] Locke , E. A. (1968). What is Job Satisfaction. (p. Paper Presented at APA Convention). APA Convention.

[35] Morse, N. C. (1953). *Satisfaction in the White Collar Job.* Michigan: Institute for Social Research, Survey Research Center.

[36] Ibid

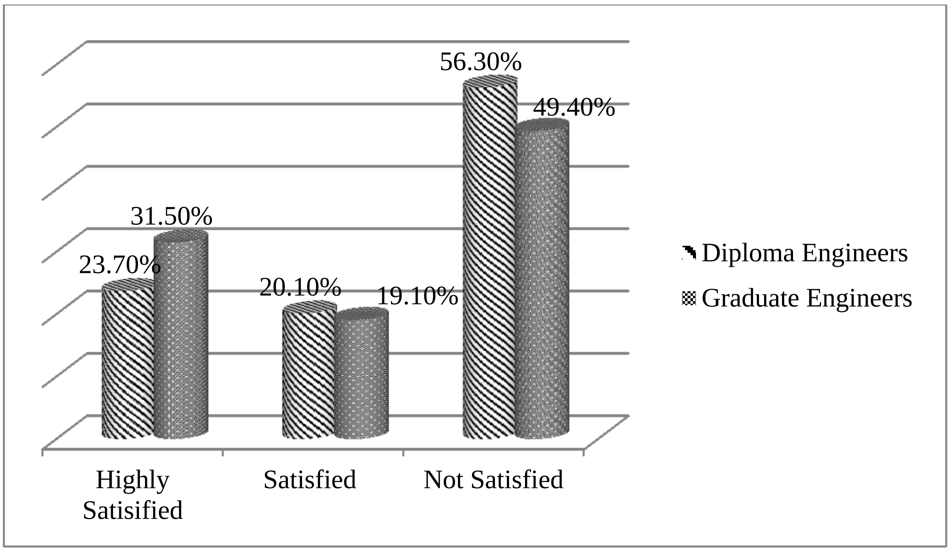

Figure 4.22 Level of Income Satisfaction of the Diploma and Graduate Engineers in Kerala

From the observations it is evident that among the engineers in Kerala the level of satisfaction is directly related to their income and hence graduate engineers are more satisfied and the diploma engineers are highly dissatisfied with their level of income.

4.7.1.2 Monthly Income and Level of Satisfaction of the Engineers among the Gender Groups

The income differences among the gender groups are a feature of the Indian labour market. The difference in the income further widens the wealth gap because the present and the expected future earnings are the major source of asset formation. The studies conducted by Laveesh Bhandariand Mridusmita Bordoloi (2006)[37] show that there exists a significant positive relationship between income and household assets. This study also reveals that even after correcting for education, experience, etc, women earn much less as compared to

[37] Laveesh Bhandari and Mridusmita Bordoloi. (2006). Income Differential and Returns to Education. *Economic and Political Weekly*.

males indicating that gender discrimination is still very prevalent in the labour market. A study by Swamy (2004)[38] found that in a number of countries export growth has created wage employment for women in income. Their incomes, quality of life and status have improved. However, gender equality has not always improved and there is continued evidence of gender discrimination in income earned. But how far females are discriminated against in the professional stream is analyzed here particularly at engineering level in order to examine whether discrimination is rampant or only a sparsely occurring event prevalent more among the lower hierarchy of the job in the unskilled category.

The level of income received also affect the level of satisfaction and the difference in the level of satisfaction among the male and females diploma and graduate engineers is examined here to analyse the significance of the difference.

The data of the monthly salary among the male and female diploma engineers shows that male engineers are earning an average monthly salary of ₹ 9,910 which is high above the average monthly salary of female diploma engineers of ₹ 5,852 .

Table 4.47 Average Monthly Salary of Male and Female Diploma and Graduate Engineers

Sex	Number	Average Monthly Salary	Standard Deviation
Diploma Engineers			
Male	189	9910.3175	527.14672
Female	90	5852.2222	253.97822
Graduate engineers			
Male	445	21010.1438	12555.39325
Female	314	17921.5382	8238.75627

Source: Field survey

[38] Swami, G. (2004). International Trade and Women. *Economic and Political Weekly Perspectives.*

The data of 759 employed graduate engineers shows that male graduate engineers are receiving an average monthly salary of ₹ 21,010 which is higher than the income earned by the female graduate engineers whose average salary is only ₹ 17,922.The high discrepancy in the salary within the group is evident as the value of standard deviation of the monthly salary is high both among the male and female graduate engineers but the difference is more dominant among the male engineers.

The level of satisfaction attained from the income when compared between the male and female diploma engineers shows that the level of satisfaction of the male engineers is greater than that of the females. At the same time the rate of dissatisfaction among the females being greater than the male engineers, it further strengthens the view that the male diploma engineers are more satisfied than the female diploma engineer sat their level of income.

The level of satisfaction attained from the income received among the graduate engineers also reveals that males are relatively more satisfied and they are relatively less dissatisfied compared to the female graduate engineers.

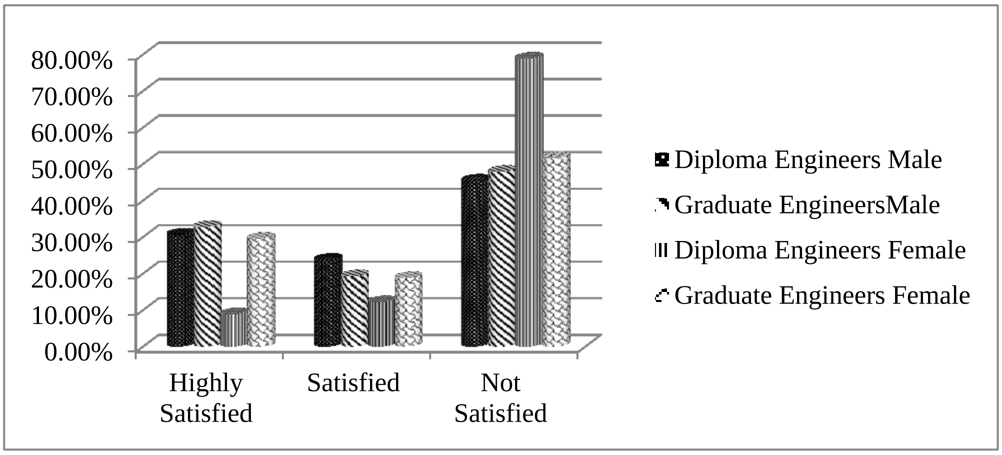

Figure 4.23 Level of Income Satisfaction among the Male and Female Diploma and Graduate Engineers

The existing discrepancy in the level of satisfaction among the gender groups shows that the females are not treated on par with the male counterparts at even professional level undermining the demographic achievements of Kerala (see Appendix IV, Table 4.7.3).

4.7.1.3 Monthly Income and Level of Satisfaction of the Engineers in Kerala and Their Social Category

The difference in income among individuals based on the caste and community is a predominant phenomenon in the Indian society. The differences in their level of backwardness are observable because of the fact that the earlier privileges enjoyed by the forward community have taken a great leap and the backward community even after concerted efforts fail to attain status equal to that of the people from the forward classes. The real victims of this deprivation are the people belonging to the scheduled castes and scheduled tribes. The social backwardness gets worsened if it is supplemented by economic backwardness as majority of them are deprived of economic resources with low employment opportunities and low income. The incidence of discrimination on the basis of caste, race and ethnicity in accessing employment and education is prevalent across the globe (Thorat S K, 1999)[39]. The prevalence of similar underprivileged situation for the socially backward castes is evident in the study conducted by Laveesh Bahndari and Mridusmitha Bordoloi (2006). It reinforces the incidence of discrimination in income because compared to others or higher caste categories though the SC/ST is more likely to be employed by about 0.8 per cent their income is likely to be about 10.5 per cent lower. The combination of higher likelihood of being employed but lower earned income therefore suggests that the lower

[39] Thorat S K and R S Deshpande. (1999, Novemeber). Caste and Labour Market Discrimination. *Indian Journal of Labour Economics*(Conference).

income is at least in part due to SC/ST working for lower wages than their non-SC/ST counterparts. In an environment where social biases are strong, many SC/STs will have little choice, but to accept a job that comes their way even if the pay is lower than what is received by a similar but non- SC/ST person. In other words not only are SC/ST less preferred in the labour market because of poor education, health and other characteristics, they are also likely to earn significantly less for the same level of education[40].

The extent to which this discrimination is evident in the case of engineers among the various social categories in Kerala is tested here both at the diploma and graduate level. The monthly average salary of the diploma engineers shows that the mean salary of the OBC students of ₹ 8,858 is relatively high and the least salary is received by the SC/ST students of ₹ 6,802.

Table 4.48 Average Monthly Salary of Diploma and Graduate Engineers and Their Social Category

Social Category	Number	Average Monthly Salary	Standard Deviation
Diploma Engineers			
General Category	68	8529.4118	3979.31438
OBC	187	8858.2888	7350.12057
SC and ST	24	6802.0833	2908.92477
Graduate Engineers			
General Category	397	20802.6599	11285.12351
OBC	326	18419.3896	10611.15659
SC and ST	36	19819.4444	11892.15394

Source: Field survey

40 Laveesh Bhandari and Mridusmita Bordoloi. (2006). Income Differential and Returns to Education. *Economic and Political Weekly*.

The data for the graduate engineers expressing the mean level of income and the distribution of income among the various social categories are shown and are computed to find whether there is any discrimination meted out to students based on their social milieu they represent at the graduate level. At graduate level engineers the general category receive the highest average monthly salary of ₹ 20,803, the SC and ST receive an average monthly salary of ₹ 19,819 and the OBC category receives the least average monthly salary of ₹ 18,419.

Thus it can be observed that as the level of education increases the discrimination in income against the backward community is more prevalent though it is absent in the lower strata of education in Kerala. This strengthens the opinion of wide spread inequality in treatment based on caste that is practised in India as more level of professional and educational qualifications are acquired.

The level of satisfaction attained, however shows a different profile because the diploma engineers belonging to general category are relatively more satisfied as compared to other groups even if their average salary is less than the OBC category. The data of the level of income satisfaction indicates that the highest number of highly satisfied diploma engineers belongs to the general category. The strength of dissatisfied engineers with regard to their income is highest among the scheduled castes and tribes.

Among the graduate engineers the level of satisfaction shows that relatively more of the general category engineers are highly satisfied, satisfied and they are also the least dissatisfied. The highest rate of dissatisfaction with the present income is however, among the engineers belonging to OBC category. (See Appendix IV, Table 4.7.4)

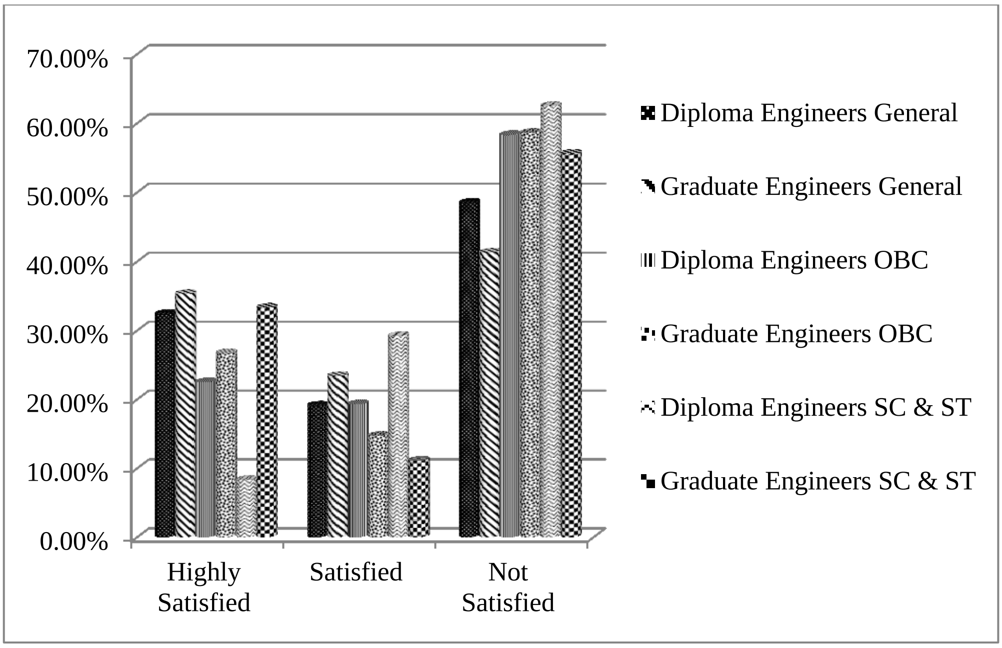

Figure 4.24 Level of Income Satisfaction of the Engineers in Kerala and Their Social Category

The wide difference in the level of satisfaction is also attributed to unequal treatment among the engineers across the cross sections of the community with some favourable treatment to those belonging to the general category engineers.

4.7.1.4 Monthly Income of the Engineers in Kerala, Their Level of Satisfaction and the Type of Institution of Study

The type of institution of study as already discussed also influences the employment prospects of the passed engineers. The engineers are absorbed in different sectors offering different rates of salary and the absorption of engineers examined on the basis of the type of institution of study may reveal some trends. The incidence of such asymmetry in the rate of salary appears primarily because some institutions with effective placement cells in operation succeed in bringing reputed companies during their placement exercises whereas others fail. Even if these are more or less governed by the academic pursuit of students influenced directly or indirectly by the type of institution of their study it is also affected by the non academic factors such as effective placement cells in operation inside the campuses. Again owing to the existence of the strength of the placement cells based on their course of study, it is found that there is some difference in the rate of employment between the diploma holders and also among the types of institutions of study. The extent to which such difference affects the level of income and the level of satisfaction is examined and analysed.

Across the various types of institutions of study among the diploma engineers it is observed that there is an incidence of higher unemployment rate in government colleges compared to private aided colleges and private unaided colleges[41].

As the rate of employment and unemployment differs across the types of institutions of study among the diploma engineers, the level of income and the monthly salary offered to these engineers will also differ and hence will unduly affect their level of income satisfaction which is discussed below.

The average monthly salary of the diploma engineers shows that the engineers of private aided colleges are remunerated most with highest average monthly salary of ₹ 9,147.The engineers from government colleges receive

[41] Shelly , M. K. (2013). Employment Scenario of Fresh Degree and Diploma Holders: Problems of Unemployment among the Engineers in Kerala. In S. Thomas (Ed.), *Employability of Fresh Engineers :Issues and Challenges* (p. 215). New Delhi: M D Publications.

monthly an average salary of ₹ 8,532 and the least remuneration among the three is received by the engineers of private unaided colleges of ₹ 8,250.

Table 4.49 Average Monthly Salary of Diploma and Graduate Engineers and the Type of Institution of Study

Type of Institution	Number	Average Monthly Salary	Standard Deviation
Diploma Engineers			
Govt College	230	8531.7391	6705.53389
Private Aided College	37	9147.2973	5334.11382
Private Unaided College	12	8250.0000	2330.62614
Graduate Engineer			
Govt College	351	21316.5954	11543.04779
Private Aided College	83	22434.5060	9388.35372
Private Unaided College	325	17331.3477	10507.22028

Source: Field survey

The level of income offered at the graduate level is higher than that of the diploma engineers. The difference in the level of income among the graduate engineers based on their institution of study is more expressed as there exist wide institutional differences in terms of the activity of placement cells and hence they affect the employment prospects of engineers. The difference in the absorption rate also varies over a period of time due to dynamic economic parameters influencing the macro economic conditions in the labour market.

The potential employment prospects of the outgoing engineers passing from different institutions varies because of the difference in the rate of absorption between the institutions. It indicates the quality of institution as employment profile and salaries on graduation is considered as one of the indicators of measuring the quality of technical education[42]. Thus in some institutions where engineers are endowed with good infrastructure, better faculty, and good academic environment their employment prospects are also high. But the engineers who are faced with poor condition in institution on the above said parameters are also denied better employment opportunities even if they are highly dexterous in their profession.

The data of the graduate engineers shows that the highest monthly salary is earned by the engineers of private aided colleges with a monthly salary of ₹ 22434. The engineers of government colleges earn an average monthly salary of ₹ 21317 and the engineers of private unaided colleges earn an average monthly salary of ₹ 17331.

The high level of income among the engineers belonging to the private aided colleges indicate that these colleges are able to attract good talents to their institutions and beyond this the active placement and other academic favourable factors existing in these institutions is a boost to the aspiring candidates in the job market.

The level of income satisfaction as attained by these engineers however, shows that among the diploma engineers the highest level of satisfaction is attained by engineers of private unaided colleges even if their income is low. The least level of dissatisfaction is among the engineers of private aided colleges.

[42] Anil, B. (2013). Quality of Education in the Newly formed Engineering Colleges and Polytechnics: Issues and Challenges. In S. Thomas (Ed.), *Employability of Fresh Engineers :Issues and Challenges* (p. 13). New Delhi: M D Publications.

Among the graduate engineers the level of income satisfaction is highest among the engineers of private aided colleges. The dissatisfaction rate is also least among the engineers of private aided colleges. (See Appendix IV, Table 4.7.5).

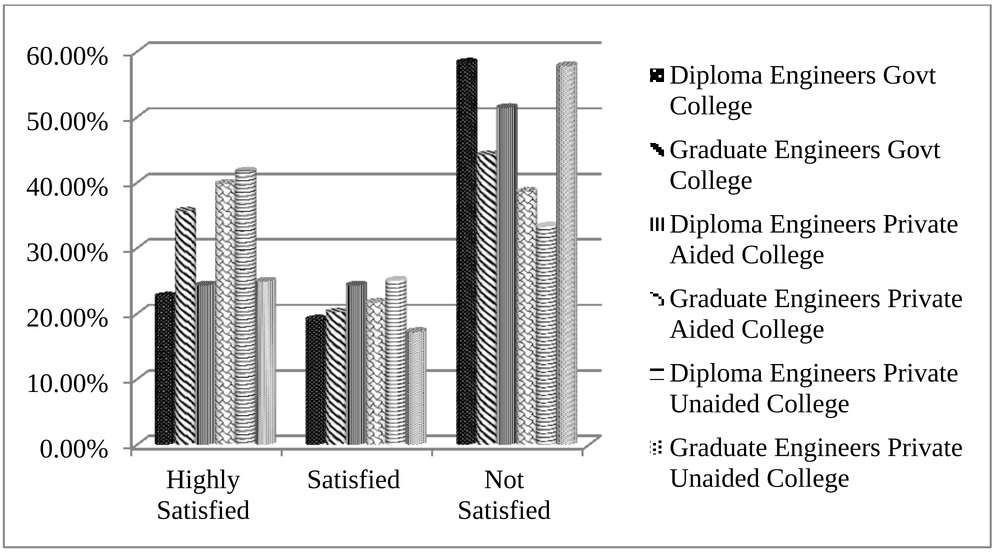

Figure 4.25 Level of Income Satisfaction among the Engineers and the Type of Institution of Study

The income level and rate of satisfaction is therefore linked with the type of institution as the private institutions are able to ensure that the satisfaction of the engineers from their institution is higher than those from the government institutions.

4.7.1.5 Monthly Income of the Rural and Urban Engineers in Kerala and their Level of Satisfaction

The other important parameters that influence the earning capacity of the engineers are their geographical profile. The engineers from rural background have limited access to good education because of the absence of reputed institutions in their vicinity or their poverty inhibits them from access to good quality education. These vary across the courses of the study because it is observed that the relative strength of the rural diploma students are more compared to the graduate engineers. Again the difference in the level of income across their areas of residence also affects their level of satisfaction. Hence it is essential to analyze the differences in the level of income and their level of satisfaction attained from income among the diploma and graduate engineers with different profile of their area of residence.

Among the employed engineers it is found that 78.5 per cent of the diploma engineers are from the rural areas whereas 63.8 per cent of the graduate engineers are from rural areas. The general perception of the fall in the enrolment of students from rural areas as the level of learning increase is also true in the case of technical education. It is particularly observed in the case of engineering education as professional courses like B. Tech. are less accessible to rural students. This is because in the Centralized Admission Process, the rank of the students is determined on the basis of the entrance scores. The urban students having an access to good training centers are likely to excel in the entrance examination score vis-à-vis their rural counterparts without such facilities in their vicinity.

The number of rural engineers however at diploma level far outnumbers the strength of urban engineers and it is also observed that the mean monthly salary received by the rural engineers of ₹ 8632 is higher than the mean monthly salary received by the urban engineers of ₹ 8488.

Table 4.50 Average Monthly Salary of Rural and Urban Diploma and Graduate Engineers

Area of Residence	Number	Average Monthly Salary	Standard Deviation
Diploma Engineers			
Rural	219	8632.1918	6783.18061
Urban	60	8488.3333	4806.39023
Graduate engineers			
Rural	472	18693.5064	10675.52232
Urban	287	21440.9129	11521.85781

Source: Field survey

The extent to which the rural and urban graduate engineers are affected in terms of the employability and job aspirations measured on their earning capacity is also analyzed here. It is observed that the graduate engineers hailing from the rural areas are earning a monthly average salary of ₹ 18693 less than the monthly average earning of urban graduate engineers of ₹ 21441.

Thus at higher level of education the earning capacity also is influenced by the geographical factors the individuals hail from.

The level of satisfaction from income received by the diploma engineers shows that the urban engineers are more satisfied as compared to the rural engineers.

The rate of dissatisfaction among the urban diploma engineers is also less than the rural engineers substantiating the fact that the urban diploma engineers are relatively more satisfied.

The level of satisfaction among the employed graduate engineers also shows that the urban graduate engineers are more satisfied with their level of income compared to the rural counterparts because the highly satisfied are from urban areas. The rate of dissatisfaction is again lower among the urban graduate engineers.(See Appendix IV Table 4.7.5)

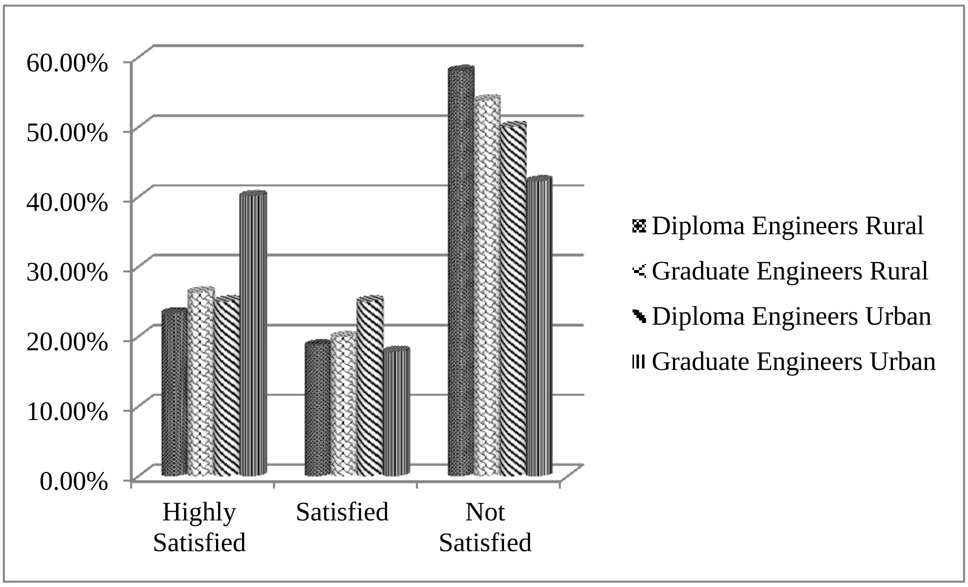

Figure 4.26 Level of Satisfaction from Income of the Engineers and Their Area of Residence

The rural urban difference in the level of satisfaction based on income is widely observable even at professional level and is the uniqueness of Indian labour market.

4.7.1.6 Employment Function of the Engineers and Their Monthly Income

The monthly income of the diploma and graduate engineers is analyzed based on the functions rendered by them. As it is known that the diploma and graduate engineers perform large number of functions after assuming a job but the monthly salary offered to them need not be the same. The high remuneration offered in other non engineering services is considered as an important factor motivating the engineers to depart from their core engineering area. This phenomenon became observable when the software and IT companies in their effort to pool good talents offered high monetary rewards for their services. The functional-wise difference in the level of income is examined among both the diploma and graduate engineers.

Table 4.51 Employment Function of the Engineers and Their level of Income

Course of Study	Employment Function	Number	Average Monthly Income	Standard Deviation
Diploma	Teaching	24	5991.6667	2224.74555
	Engineering	214	9000.2336	6909.50305
	Administration and Management	3	8000.0000	2000.00000
	Software/Hardware	11	9000.0000	4582.57569
	Clerical or Office work	27	7662.9630	5074.98754
	Total	279	8601.2545	6402.13320
Graduate Engineering	Teaching	104	16236.5385	8153.94333
	Engineering	310	21418.3097	13928.46852
	Administration and Management	32	25981.6875	12761.94022
	Software/Hardware	257	19440.6109	7451.94996
	Clerical or Office work	56	14659.8214	6132.67271
	Total	759	19732.3808	11076.19071

Source: Field survey

The monthly income among the diploma engineers is found to be the highest in engineering services with their difference only marginal and statistically insignificant. Among the graduate engineers the monthly salary is high among those who are in administration and management. The engineering service is considered to be more remunerative than the software and hardware. Thus it indicates that remuneration in pure engineering services is no longer less as compared to the software and others.

The deviation to other non core engineering areas are therefore, attributed to factors such as non availability of job and other attractions of the job**.**

4.7.1.7 Sector of Employment of the Engineers and Their Monthly Income

The engineers working in different sectors of the economy are not equally remunerated. An attraction to a particular sector is motivated to a large extent based on the monetary rewards. A lower salary being offered in a particular sector is then considered as a disincentive for any labour which in the case of a professional will unduly affect the efficiency of the firm where that professional is employed. The average monthly salary drawn by the diploma and graduate engineers will help us in understanding the numerical variation in the level of income among the engineers who are working in the various sectors of the economy.

Both among the diploma and graduate engineers it is observed that the private sector is more remunerative than the government and public sectors. The average monthly salary drawn by the engineers however, shows that the difference in salary between the various sectors of employment is not numerically high. The available facts therefore, do not support the argument that the monetary rewards is a major factor attracting the job seekers for employment in a particular sector.

Table 4.52 Sector of Employment of the Engineers and Their level of Income

Course of Study	Sector of Employment	Number	Average Monthly Income	Standard Deviation
Diploma Engineering	Government Sector	51	8533.3333	5052.51093
	Public Sector	40	7025.0000	4943.20305
	Private sector	182	9049.7253	7034.10496
	Others	6	6083.3333	2653.61389
	Total	279	8601.2545	6402.13320
Graduate Engineering	Government Sector	94	17194.7660	11073.77123
	Public Sector	67	19266.3881	11476.76647
	Private Sector	565	20249.4177	11194.00505
	Others	33	19054.5455	6700.61056
	Total	759	19732.3808	11076.19071

Source: Field survey

4.7.2 Level of Monthly Income of the Diploma and Graduate Engineers in Kerala, Their Level of Satisfaction: Inferential Analysis of the Primary Data

The level of income difference among the diploma and graduate engineers is analysed based on ANOVA test and the results are given in the Table 4.53.

The table shows that the difference in the level of income of engineers is significant for the branch of study, their gender characteristics both among the diploma and graduate engineers but for all other categories among the diploma engineers they do not have any significant influence on determining the level of income.

Table 4.53 ANOVA Results of the Level of Income of the Diploma and Graduate Engineers

Course of Study	Characteristics	F Value	df	Sig.
Diploma	Branch of study	3.948	8	.000***
Graduate	Branch of Study	5.046	6	.000***
Diploma	Gender	26.766	1	.000***
Graduate	Gender	14.571	1	.000***
Diploma	Social Category	1.104	2	0.333
Graduate	Social Category	4.180	2	.016**
Diploma	Type of Institution	.165	2	0.848
Graduate	Type of Institution	14.172	2	.000***
Diploma	Area of Residence	.024	1	0.878
Graduate	Area of Residence	11.128	1	0.001***
Diploma	Employment Function	1.374	4	.243
Graduate	Employment Function	10.405	4	.000***
Diploma	Sector of Employment	1.424	3	.236
Graduate	Sector of Employment	2.145	3	.093*

***significant at 1% level,**significant at 5% level,*significant at 10%

For graduate engineers the social category of the engineers, the type of institution of study and the area of residence is also a determining factor in the level of income. The difference in the monthly salary based on the functions and sector of employment is also observable among the graduate engineers.

The level of satisfaction attained by the diploma and graduate engineers and the difference in the level of satisfaction is analyzed through Kruskal Wallis test. The results are given in the table 4.54

Table 4.54 Level of Income Satisfaction among the Diploma and Graduate Engineers: Inferential Results

Course of Study	Characteristics	Category	Kruskal Wallis	df	Sig.
Diploma	Level of Income satisfaction	Branch	13.811	8	.087
Graduate	Level of Income satisfaction	Branch	4.389	6	0.624
Diploma	Level of Income satisfaction	Gender	27.923	1	.000***
Graduate	Level of Income satisfaction	Gender	1.139	1	0.286
Diploma	Level of Income satisfaction	Social Category	3.869	2	0.144
Graduate	Level of Income satisfaction	Social Category	16.831	2	.000***
Diploma	Level of Income satisfaction	Type of Institution	3.450	2	0.178
Graduate	Level of Income satisfaction	Type of Institution	17.619	2	.000***
Diploma	Level of Income satisfaction	Area of Residence	.825	0	0.364
Graduate	Level of Income satisfaction	Area of Residence	14.236	1	.000***

***significant at 1% level,**significant at 5% level,*significant at 10% level

The table shows that the difference in the level of satisfaction among the diploma engineers is significant only across their gender characteristics, whereas among the graduate engineers the difference in the level of income satisfaction is significant across the social category, the type of institution of study and the area of residence of the engineers.

4.8 Findings and Conclusions

The employment profile of the engineers of Kerala shows that each characteristics of the employment of engineers of Kerala is influenced by a large number of factors with some being statistically significant and others statistically insignificant.

The diversion of employment to other non engineering and other areas of specialization is prevalent more among the graduate engineers than the diploma engineers of Kerala. A comparison of the area in which the engineers are employed based on their gender characteristics shows that the diversion of employment to other non engineering and other areas of specialization is prevalent more among the female engineers of Kerala. While classifying the engineers into various characteristics it is found that the difference in the diversification of employment among the engineers determined on the basis of their branch of study and gender is found statistically significant. And above all the major factor that forces engineers for diversion to other areas for employment among the engineers in Kerala is mainly due to the lack of job offer in their area of study at present.

The function-wise analysis shows that majority of the employed diploma engineers are working in engineering related activities whereas the employed graduate engineers are working more in areas other than in engineering. The gender-wise employment function shows that the females are more in non engineering areas compared to the male engineers. The difference in the employment function of the engineers across the branches of study, their gender characteristics, social category is statistically significant among both the diploma and graduate engineers.

Both among the diploma and the graduate engineers the private sector is the major destination of employment of engineers and is the largest employment absorber of them. The engineers belonging to SC and ST community are relatively fewer in strength in the private sector and they find government sector as their major destination of employment vis-à-vis other communities. The difference in the sector of employment determined by the branch of their study and social category is found statistically significant among both the diploma and graduate engineers.

Both among the diploma and graduate engineers, direct application is the main source of getting employment. The campus or off campus placement is found more relevant for the graduate engineers than the diploma engineers. The difference in the means of getting employment determined on the basis of the branch of study is statistically significant among both the diploma and graduate engineers.

The satisfaction obtained from job shows that it is relatively more among the diploma engineers than among the graduate engineers. The level of job satisfaction of the engineers also depends upon the function undertaken and the sector of employment of the engineers. The difference in the level of job satisfaction determined on the basis of branch of study and gender characteristics is statistically significant only for the diploma engineers whereas for the graduate engineers such difference is statistically significant based on their social category and type of institution of study.

The monthly average income of the engineers reveals that it is higher among the graduate engineers than the diploma engineers. The level of dissatisfaction from income among the diploma engineers is greater than the graduate engineers. The average monthly income of the male engineers is higher than the female engineers and therefore the level of dissatisfaction from income is higher among the female engineers. The monthly income of the engineers also depends upon the function of the engineers but it is not uniformly observed between the diploma and graduate engineers. The private sector is considered to be more remunerative on average but the difference is not statistically significant. While classifying the engineers into rural and urban it is found that the rural engineers are more dissatisfied as compared to the urban engineers.

The ANOVA results shows that the difference in the monthly income among both the diploma and graduate engineers is statistically significant based on their branch of study and gender characteristics. The difference in the level of income satisfaction is statistically significant among the diploma engineers only on the basis of their gender characteristics whereas among the graduate engineers such difference is statistically significant based on their social category, type of institution of study and area of residence of the engineers.

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Chapter 5

ACADEMIC ACHIEVEMENT OF THE DIPLOMA AND THE GRADUATE ENGINEERS: HIGHER STUDIES AS AN ALTERNATIVE AVENUE OF EMPLOYMENT

Contents

5.1 Introduction

The engineering education also considered as a professional education is now the cynosure for large number of students who hail from the varied sections of the society. The growing popularity of this profession has resulted in a cut throat competition among the students for entry in this stream of education and is the dream of many. It is also found that rigorous training is undergone by majority of the students in order to succeed in entering this profession particularly in the advent of the large number of professional entrance coaching classes turning out that provide training for the aspiring students. But the high demand for this courses particularly in the engineering education could not be met by the government alone. Therefore, the government pursued policies to encourage the private players in this field. Consequently, large number of private self financing colleges emerged thereby damaging badly the quality of engineering education. This peculiar development leading to the dilution in the quality of the engineering education was more evident at the graduate level. Presently it has reached a stage when the never deserving students in the profession also succeed in entering this profession, nevertheless caring about the possibility of even being a non-graduate as the final outcome due to the huge burden of the back-paper syndrome. The back-paper syndrome here refers to the growing anxiety of the engineering professionals about their prospects of being declared ineligible for awarding a degree even after the completion of the course. In recent years the engineering students are observed to realize of late that this education is not their cup of tea after second or third year of their engineering education. From then onwards, it is found that there is a mental battle within the student to complete the course to keep the pride of the family on one side and on the other to protect one's own interest which remains a dream[1]. The engineering education now records the highest failure rate among all the professional education and discharge the largest number of academic dropouts at professional level merely because of the wrong policies and educational misconceptions.

The engineering education and their employment aspects without addressing the issue of academic quality and standards is, therefore, incomplete. It is also observed that the presumption of the quality remaining

[1] Shyam, Rajgopal and Krishnakumar,G. (2012, February 25). Engineering Students Affected with Back Paper Syndrome. *The Hindu*.

the same in the technical education is void because the pass rates are coming down especially after the expansion of the self financing colleges. This is because of the widespread shortage of the qualified teachers, no monitoring of teaching quality especially in the coverage of syllabus, its assessment and methods of teaching, etc.that is envisaged in AICTE norms[2].

Apart from the poor performance of the engineering students in their academic pursuit, the wide difference among the students in the academic performance based on some characteristics is also a matter of great concern for the policy makers. It is also identified that some of the determinants of failure rate of engineering students are the economic variables whereas others are non-economic. The important factors that determine the academic performance of the students are based on the occupation of the head of the household, and also there are other variables that uniquely determine household characteristics. Apart from this, the performance of the engineering students in SSLC and Plus-Two and marks awarded in Mathematics, English and the five variables on the environment and infrastructure in which students are placed also determine the level of performance of the students in engineering (K Pushpangadan, 2013).[3] An attempt is here made to analyze the academic achievement of the diploma and graduate engineers among the various groups classified on the basis of their branches of study, their gender characteristics, their social background, the level of parental education and their area of residence among the diploma and the graduate engineers to determine the

[2] Pushpangadan, K. (2013). Failure Rates and their Determinants in Engineering Degree Courses in Kerala: Factor Analysisof a Socially Deprived Group. In D. S. Thomas (Ed.), *Employability of Fresh Engineers-Issues and Challenges* (pp. 117-134). New Delhi: M D Publications Pvt Ltd.

[3] Ibid.,p.118

strength of these variables in determining the level of academic performance and also the activity status of the fresh engineers.

5.2 The Academic Achievement of the Diploma and Graduate Engineers – Its Meaning and Measurement: Descriptive and Inferential analysis

The academic achievement here indicates the outcome of the engineers which is examined on the basis of some standard tools of measurement administered by the competent authorities. There are various means to assess the academic performance of the students. Among the various methods of assessment, percentage of marks scored by the students is the proxy variable having large recognition in measuring the level of academic achievement among the students. Thus in the present study the percentage of marks obtained by the engineering students in diploma or degree examination during their entire course of study is considered as the means of measuring their level of academic achievement.

The information in this respect is gathered from the samples collected through the questionnaire. Besides this, information is also collected from the engineering students regarding their higher studies to know the factors that motivated some of them to join for higher studies. The new opportunity of joining higher studies is also an alternative to employment and also a subtle way of escaping from the situation of forthcoming possibility of unemployment among a few.

The factors that influence the academic achievement of students vary from personal to social, and are also influenced by institutional, economic and demographic characteristics. The extent of the difference in the academic achievement among the engineers across their branches of study, gender characteristics, their social background, type of institution of study, etc. is examined here for analysis.

5.2.1 Academic Achievement of the Diploma and Graduate Engineers in Kerala and Their Branch of study

The academic performance of the diploma engineers in some of the prominent branches and also in others are evaluated to know the differences in their achievement. As discussed earlier, the percentage of marks scored by the student in the overall course of the study is chosen for effective comparison.

Branch-wise academic achievement of diploma engineers: The branch-wise comparison of the academic achievement of students is made on the new forms of branch arrangement where the nine branches are identified for comparison. The detailed branch-wise analysis of the academic performance of the students is shown in the Appendix V, table 5.1.

Table 5.1 Branch of Study and Percentage of Marks Scored by the Diploma Engineers in Kerala

Branch of Study	Number	Mean Marks scored in %	Standard Deviation
Civil, Architecture and related branches	80	69.2500	7.22426
Commercial Practice	22	69.5455	5.72985
Computer Engineering	90	68.0000	6.86957
CABM, Hardware maintenance and IT	50	69.4000	6.31163
Electrical	72	71.0417	7.15313
Electronics and Applied Electronics	111	71.1802	7.38819
Electronics and Communication and other related branches	60	72.5833	7.96027
Mechanical	80	69.6000	6.72580
Others	99	70.5051	8.12139
Total	664	70.1491	7.28107

Source: Field survey

The data of the academic achievement of the students measured in average percentage of marks scored for the diploma engineers as shown in table 5.1 indicates that the percentage of marks is highest in the branch of electronics and communication and related branches while the least achievement is among the students in the branch of computer engineering.

Table 5.2 ANOVA Results of the Academic Achievement of the Diploma Engineers

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1083.983	8	135.498	2.605	.008***
Within Groups	34064.257	655	52.006		
Total	35148.239	663			

***significant at 1%level

The difference in the academic performance of the students based on the ANOVA results shows that their difference is significant.

The degree of influence of academic performance of the engineers on their employment aspect is known only when a comparison is made between academic achievement and activity status of the engineers. It is observed that among the diploma engineers the students are academically better off in the branch of electronics and communication than the students in other branches and their activity status shows that the option for higher studies is also relatively more in this branch of study than the others. It implies that the academic performance and number of students joining for higher studies are positively related in the case of diploma engineers in Kerala.

In the branch of computer science with relatively low academic score, the activity status, however, reveals that the engineers on regular paid job rate are high and also the rate of unemployment is low compared to the branch of electronics and communication. Thus the academic performance examined and analysed on the basis of their branch of study do not show any specific positive relation between the academic performance of these engineers and their chance of being employed (see also Table 3.6 in chapter 3 for comparison).

Branch-wise academic achievement of graduate engineers: The graduate engineers enter in the engineering stream through different methods. The meritorious students are largely selected on the basis of the rank list of the combined engineering entrance examination held at the state and national level prepared by a competent agency. But, some are admitted not on the basis of merit. This practice ultimately worsens the existing qualitative difference among the engineering students due to their differences in intelligence and aptitude. Hence the poor performance of the students can also be attributed to the poor quality of intake.

The scale of the academic performance of the engineering graduates is measured on the basis of the percentage of marks scored in their examination and the complete branch-wise comparison of these students about their academic performance is shown in Appendix V, table 5.2.

The present branch-wise analysis, however, focus on the new forms of arrangement of the branch of studies as done before.

Table 5.3 Branch of Study and Percentage of Marks Scored by the Graduate Engineers in Kerala

Branch of Study	Number	Mean Marks scored in %	Standard Deviation
Civil and Architecture	92	69.18	7.83
Computer Science	232	68.85	5.20
Electrical and Electronics	202	69.01	6.83
Electronics and Communication	291	68.70	5.64
Information Technology	89	68.40	5.19
Mechanical	163	69.10	5.59
Others	168	69.22	6.43
Total	1237	68.91	6.03

Source:Field survey

Among the graduate engineers the average marks of the group belonging to others is marginally higher than all the branches of study and the Anova results of the academic achievement of the graduate engineers shows that it is not significant even at ten percent level implying that the difference in the academic achievement among the graduate engineers is not significantly influenced by their branch of study. The individual branch-wise comparison is, therefore irrelevant.

Table 5.4 ANOVA Results of the Academic Achievement of the Graduate Engineers

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	68.761	6	11.460		
Within Groups	44839.992	1230	36.455	.314	.930
Total	44908.753	1236			

5.2.2 Academic Achievement of the Male and Female Diploma and Graduate Engineers

The academic achievements of the male and female at many levels of learning shows an edge of females over males due to many reasons. The formal education at all levels from the secondary examination to higher education in Kerala shows that the females out-perform the males but there is a reverse trend in the professional entrance examinations where the males out perform their female counterparts, particularly in the engineering entrance examination. This difference in the performance is attributed to many factors including the failure of the formal education system particularly the general education, in training the students to acquire the skills that are required for an entry in professional courses.

The aim of the professional education is to equip the learner with new skills that are essential for employment as envisaged in the chosen profession. Thus each curriculum in the professional stream is structured in such a way that the new learners are provided training to interact directly with the environment where they are exposed in their professional career. The ability to acquire and apply this knowledge is measured on the basis of the percentage of marks scored in the examinations which is a proxy variable used to measure their standards.

The academic achievement of the engineering students measured on the basis of the percentage of marks scored in the examination and classified on the basis of the gender characteristics is given in the table 5.5. The academic achievement of the male and female engineers shows that the women engineers outperform men academically both at the diploma and graduate level of engineering as the average marks of female engineers is greater than that of the males.

Table 5.5 Academic Achievement of the Male and Female Diploma and Graduate Engineers

Course and gender	Number	Mean marks scored in %	Standard deviation
Diploma			
Male	418	69.84	7.50
Female	246	70.66	6.87
Graduate			
Male	644	68.53	5.57996
Female	593	69.34	6.45740

Source: Field survey

The ANOVA table however shows that the difference in academic achievement between the male and female engineers is significant only at the graduate level whereas among the diploma engineers such difference is only a coincidence with no statistical significance.

Table 5.6 ANOVA Results of the Academic Achievement of the Male and Female Engineers

	Sum of Squares	df	Mean Square	F	Sig.
Diploma					
Between Groups	101.418	1	101.418	1.916	.167
Within Groups	35046.822	662	52.941		
Total	35148.239	663			
Graduate					
Between Groups	203.123	1	203.123	5.611	.018**
Within Groups	44705.630	1235	36.199		
Total	44908.753	1236			

******significant at 5 % level

The academic achievement when compared with the rate of unemployment indicates that both among the diploma and graduates the female unemployment rate is higher than the male engineers even if the academic achievement among the females is better than their male counterparts. Thus academic achievement has not directly affected the employment even among the gender groups.

5.2.3 Academic Achievement of the Diploma and Graduate Engineers and Their Social Background

In India the social structure based on caste is largely responsible for the social and economic inequalities existing between the different caste groups. The distortions in the distribution of income and wealth further aggravate the existing problem of inequality and there are situations when the ability of all the students is not potentially utilized. In India before independence, the forward classes enjoyed the privilege of better education but the backward and other non forward communities were deprived of the basic education. The backward communities deprived of education for generations were later identified as scheduled caste and tribes who are cut-off from the main streams of development. Hence conscious and deliberate attempt is made by all the ruling parties in governance in India to uplift the backward classes by providing opportunities of education at all stages through the policies of reservation of seats to the students belonging to such communities. This policy changes has narrowed the difference between the students in their academic enrolment. In general education the changes are observed with an increase in the enrolment of these students and also in their rate of success. However this feature is observable only till a particular stage of education and engineering education because of its professional nature and level of education do not ensure such equality. But recently the enrolment of students belonging to these communities has increased in engineering but the success rate has not increased proportionately. A study conducted to assess the success rate of the engineering graduates during the year 2008 for various social category shows that the pass per cent of the general category and other unreserved category students is 68.4 per cent whereas for the OBC students it is above 40 per cent. The lowest pass rate of 17.7 per cent is among the ST students and for the SC students it is between 17.7 per cent and 20 per cent just above the ST students[4].

The academic achievement measured in percentage of marks scored among the diploma and graduate engineers is, therefore, analysed among the various social groups in order to determine the strength of the social factors in affecting their academic achievements.

Table 5.7 Academic Achievement of the Diploma and Graduate Engineers and Their Social Category

Course and Social Category	Number	Mean marks scored in %	Standard deviation
Diploma			
General Category	195	71.22	7.78
Other Backward Class	414	70.03	7.02
SC or ST	55	67.25	6.53
Graduate			
General Category	624	69.69	5.94
Other Backward Class	548	68.42	6.00
SC or ST	65	65.58	5.56

Source: Field survey

The table shows that both among the diploma and graduate engineers the mean score of the general category students is greater than the backward class

[4] Ibid., p.124

students. If we compare the academic achievement of these students with the unemployment rate it is observed that both among the diploma and graduate engineers the unemployment rate is also high among the backward communities implying that the degree of academic achievement is a factor determining employment if analysed on the basis of the social categorisation.

Table 5.8 ANOVA Results of the Academic Achievement of the Engineers and Their Social Category

	Sum of Squares	df	Mean Square	F	Sig.
Diploma					
Between Groups	693.024	2	346.512	6.648	.001***
Within Groups	34455.216	661	52.126		
Total	35148.239	663			
Graduate					
Between Groups	1233.134	2	616.567	17.420	.000***
Within Groups	43675.620	1234	35.394		
Total	44908.753	1236			

***significant at 1 % level

The ANOVA results of the diploma and graduate engineers shows that the difference in the academic achievement among the engineers classified on the basis of their social category is also significant.

5.2.4 Academic Achievement of the Diploma and Graduate Engineers and Their Area of Residence

The geographical difference in terms of development existing in India across the regions and locality is an observable phenomenon. Indian development characterized by regional backwardness is a major factor responsible for the existing divergence between the rural and urban population. The regional developmental characteristics and the educational policies pursued by the governments ruling in each state determine the strength of education existing at each stage. Thus some regions have good centres of learning whereas the population in other parts are deprived of such facilities. This is substantiated by the fact that there is a large concentration of institutions of higher learning in certain regions of the country. The concentration of engineering colleges in the states of Tamil Nadu, Karnataka, Andhra Pradesh and Maharashtra is a good example of the existing regional difference in educational facilities. The disproportionate outturn of the technocrats from these states in the country and the continuation of such trends will result in the employment scenario of having surplus technocrats in one region whereas deficit in other regions[5]. This difference spreading across the rural and urban areas is now considered as the greatest hurdle in the accomplishment of equality as envisaged in the objectives of planning in India.

The rural-urban difference should essentially narrow beginning from the primary education and also at higher levels of learning. The students joining professional education are distinct on many features because of the mode of selection. The extent of the difference in the engineering education between the rural and urban population is examined here. It is also examined whether the professional education is free from discriminations based on the developmental background of students. It is analyzed by comparing the academic achievements of the engineering students belonging to the rural and urban areas.

[5] Needhidasan, S. (2005). Technical Manpower in Engineering Institutions in India Present Scenario and Future Needs. In M. K. Sudhir Reddy (Ed.), *Technical Manpower Planning* (pp. 172-186). New Delhi: Discovery Publishing House.

Table 5.9 Academic Achievement of the Diploma and Graduate Engineers and Their Area of Residence

Course and social category	Number	Mean marks scored in %	Standard deviation
Diploma			
Rural	504	69.9583	7.13964
Urban	160	70.7500	7.70200
Graduate			
Rural	780	68.5846	6.03471
Urban	457	69.4880	5.97953

Source: Field survey

The data confirms that both among the diploma and graduate engineers in Kerala the academic achievement of the urban engineers is higher than that of the rural engineers. If we compare the existing rate of unemployment between these two groups, it is also found that the unemployment rate of rural population is also higher than the urban among both the diploma and graduate engineers implying that academic achievement has a direct bearing on the incidence of unemployment among the engineers classified on the basis of their area of residence.

The ANOVA results of the academic achievement of the engineers classified on the basis of their area of residence shows that among the diploma engineers the difference in the academic achievement between the rural and urban population is not significant but their difference is statistically significant among the graduate engineers.

Table 5.10 ANOVA Results of the Academic Achievement of the Engineers and Their Area of Residence

	Sum of Squares	df	Mean Square	F	Sig.
Diploma					
Between Groups	76.114	1	76.114	1.437	.231
Within Groups	35072.125	662	52.979		
Total	35148.239	663			
Graduate					
Between Groups	235.154	1	235.154	6.501	.011**
Within Groups	44673.599	1235	36.173		
Total	44908.753	1236			

**significant at 5 % level

5.2.5 Academic Achievement of the Diploma and Graduate Engineers and the Type of Institution of Study

The engineering students both at the diploma level and graduate level pursue their studies from various institutions and the institutional background also influence the academic achievement of the students. This is because the engineering students studying in an institution are either in advantage or disadvantage owing to the different infrastructural facilities, the quality of faculty, the ease with which the engineering students are placed for employment, etc. Thus the present admission of students is the result of the existing and established repute of the institutions judged on the basis of any of the above parameters. The quality of the intake therefore, has a direct bearing on the quality of outturn of the students.

Table 5.11 Academic Achievement of the Diploma and Graduate Engineers and the Type of Institution

Course and social category	Number	Mean marks scored in %	Standard deviation
Diploma			
Govt College	518	70.2645	7.03772
Private Aided College	117	69.7521	8.26595
Private Unaided College	29	69.6897	7.52189
Graduate			
Govt College	550	69.5818	6.28843
Private Aided College	119	69.2437	6.34858
Private Unaided College	568	68.2077	5.61892

Source: Field survey

The academic achievement of the diploma and graduate engineers shows that it is high in the government colleges compared to the aided and unaided colleges. If we make a comparison of the academic achievement and rate of unemployment of the engineers it is observed that unemployment is high in government diploma colleges whereas at graduate level it is high in private unaided colleges. It implies that the academic achievements and unemployment rates do not indicate any relation between the engineers if classified on the basis of the type of institution of study.

Table 5.12 ANOVA Results of the Academic Achievement of the Engineers and the Type of Institution of Study

	Sum of Squares	df	Mean Square	F	Sig.
Diploma					
Between Groups	31.454	2	15.727	.296	.744
Within Groups	35116.785	661	53.127		
Total	35148.239	663			
Graduate					
Between Groups	541.517	2	270.758	7.531	.001***
Within Groups	44367.237	1234	35.954		
Total	44908.753	1236			

***significant at 1 % level

The ANOVA table of the academic achievement of the engineers and the type of institution of study shows that the difference in the academic achievement among the diploma engineers from various institutions is insignificant but their difference is significant among the graduate engineers.

5.2.6 Academic Achievement of the Diploma and Graduate Engineers and the Level of Parental Education

The engineering students are bought up in different environment with different levels of parental education and this will also affect the levels of academic performance. The parental education affects the academic results because the students of educated parents are privileged to have better care and guidance which positively affect the level of academic achievements of the students.

The diploma and graduate engineers when examined on the basis of their level of parental education shows that as the level of parental education increases the average percentage of marks scored by the diploma engineers also increases. Hence the average percentage of marks scored by the engineers of highly educated parents is greater than those of mediocre and those of parents with low level of education. But among the graduate engineers the percentage of marks scored by the engineers of parents with mediocre level of education is greater than the engineers of highly educated parents.

Table 5.13 Academic Achievement of the Diploma and Graduate Engineers and the Level of Parental Education

Course and level of Parental Education	Number	Mean marks scored in %	Standard deviation
Diploma			
Low Educated Parents	515	69.3515	7.15957
Educated Parents	97	72.4124	7.34103
Highly Educated Parents	52	73.8269	6.41604
Graduate			
Low Educated Parents	266	68.2556	6.00145
Educated Parents	219	68.5525	5.91614
Highly Educated Parents	752	69.2593	6.05132

Source: Field survey

If we compare the level of parental education with the rate of unemployment it is observed that the unemployment rate of engineers of low educated parents is greater than the educated and highly educated parents among both the diploma and graduate engineers. Thus it can be concluded that parental education has a direct bearing on the academic achievement and therefore, necessarily determines their chance of employment.

Table 5.14 ANOVA Results of the Academic Achievement of the Engineers and the Level of Parental Education

	Sum of Squares	df	Mean Square	F	Sig.
Diploma					
Between Groups	1527.906	2	763.953	15.020	.000***
Within Groups	33620.334	661	50.863		
Total	35148.239	663			
Graduate					
Between Groups	233.556	2	116.778	3.226	.040**
Within Groups	44675.198	1234	36.204		
Total	44908.753	1236			

***significant at 1% level and ** significant at 5% level

The ANOVA table of the difference in the academic achievement among the engineers shows that the difference in academic achievement based on the level of parental education is significant implying that the level of parental education has affected the academic performance of the students.

5.3 Engineers Opting for Higher Studies and the Reasons for Opting Higher Studies: Descriptive Analysis of the Primary Data

Among the various roles assumed by the engineers after the completion of their course a significant number of engineers pursue higher studies with more than 28 per cent of the diploma engineers and 18 per cent of the graduate engineers opting for higher studies. The motive of joining for higher studies are different and the area of higher studies are also different. The diploma engineers who attempt to increase their prospects of employment for a better career join the B. Tech course. Similarly with the upcoming of new engineering colleges the demand for qualified M.Tech. engineers has increased manifold times and large number of the graduate engineers pursue an M.Tech. degree to qualify for the post of Teaching. The demand for M.Tech. in a particular branch depends on the available and forthcoming anticipated vacancies mainly in teaching arising due to the initiation of new branches or else with the opening of new engineering colleges.

5.3.1 Engineers Opting for Higher Studies and the Reason for Joining Higher Studies:The Branch-wise Analysis

The desire of the students for pursuing higher studies among the diploma and graduate engineers across their branch of study is examined here in order to know their area of study and also the motive for joining such courses.

Diploma engineers opting for higher studies and the reasons for joining such courses

The diploma engineers opt for higher studies more or less to attain a B.Tech. degree in their respective branch of study and this is encouraged by the government enabling diploma holders to join the B.Tech. courses through lateral entry method. But there are also incidence of students opting for higher studies in order to avoid the agony of unemployment and hence join even in those courses that are not related to engineering. The reasons for pursuing higher studies are also motivated by factors having no association and relation with academic interest of the engineers. The present study therefore, examines the area of higher study of the engineers and also the various factors that prompted the engineers to join for higher studies.

Table 5.15 Diploma Engineers Opting for Higher Studies Related to the Area of the Studies and Reasons for Joining Higher Studies: Branch Analysis

Branch of study	Area of higher studies				Reasons for joining higher studies					
	Related to the diploma engineering		Not related to the diploma engineering		Self Interest		No Job Opportunities		For career improvement	
	No.	%	No.	%	No.	%	No.	%	No.	%
Civil, Architecture and related branches	19	90.5	2	9.5	15	71.4	6	28.6	0	-
Commercial Practice	0	-	2	100.0	0	-	2	100.0	0	-
Computer Engineering	31	100.0	0	-	19	61.3	12	38.7	0	-
CABM,CHM, and I T	9	81.8	2	18.2	8	72.7	1	9.1	2	18.2
Electrical	24	100.0	0	-	16	66.7	5	20.8	3	12.5
Electronics and Applied Electronics	34	97.1	1	2.9	30	85.7	4	11.4	1	2.9
E&C and other related branch	22	91.7	2	8.3	15	62.5	5	20.8	4	16.7
Mechanical	21	95.5	1	4.5	19	86.4	3	13.6	0	-
Others	20	95.2	1	4.8	16	76.2	0	-	5	23.8
Total	180	94.2	11	5.8	138	72.3	38	19.9	15	7.9

Source: Field survey

The diploma engineers when compared with the graduate engineers have only less opportunity for higher studies since some of the students hold only a secondary school certificate. The data of the diploma engineers opting for higher studies, shows that 28.8 per cent of the passed engineers have opted for higher studies (see Table 3.6 Chapter3) where 94.2 per cent of them have joined for B.Tech. course which is essentially related to the diploma.

Among the various branches of study, it is observed that in the branch of computer engineering and electrical all the students have opted for higher studies in their respective area. The largest diversion to other areas for higher studies is obviously observed in the branch of commercial practice having no engineering related area for further studies.

The factor that has motivated the students to opt for higher studies is also analyzed in order to know whether the engineers had joined due to push factor or pull factor. The inquisitiveness to attain higher levels of learning is the pull factor, and among them the factors identified are the self interest and motivation from others. The push factor forcing the engineers to join for higher studies is the lack of job opportunities in the present area of study. The rest joined higher studies for career improvement which is both a push and pull factor. The engineers who are only willing to take up jobs in the higher ladder will definitely join for higher studies and it is considered as a pull factor. On the other hand there are others who joined for higher studies to widen their scope of employment but, both have expressed their reason of higher studies as, for career improvement. Hence it is difficult to identify the real and genuine pull and push factors for joining higher studies among the engineering students.

Among the diploma engineers, 72.3 per cent of engineers have opted for higher studies because of self-interest and 19.9 per cent of the engineers have opted for higher studies because of no job opportunities in the area of study and 7.9 per cent of the engineering students have opted for higher studies for career improvement. The data also shows that in all the branches, the majority of the students have stated self interest as the reason for joining higher studies except in commercial practice where all the students have stated no job opportunities in their area of study as the reason for pursuing higher studies.

Graduate engineers opting for higher studies and the reasons for joining such courses

The graduate engineers are less interested in higher studies compared to the diploma engineers because their chance of sooner employment is higher than the diploma engineers. But with the emergence of employment in Teaching arising mainly in the new engineering colleges and preferred by some of the engineers, the graduate engineers particularly the females are willing to join for higher studies. The stringent regulations and norms fixed by AICTE requiring an M.Tech. degree as mandatory and essential for the post of teaching has attracted many of the engineering students to opt for an M.Tech. course.

The total engineering graduate sample of 1237 when examined shows that 18.10 per cent opted for higher studies which are less than the number of diploma engineers who opt for higher studies. It is also found that among the graduate engineers opting higher studies 77.7 per cent joined for an M.Tech. whereas 22.3 per cent of the students are in courses other than M.Tech. Among the branches it is observed that in the branch of Civil and Architecture and also in Information Technology all the engineers joined only for an M.Tech. course whereas the diversion to courses other than M.Tech is highest in the branch of computer science. This is mainly because the civil and architecture engineers are left with few higher option in non engineering areas whereas for computer engineers there are large number of openings in the software which provides them with ample opportunities for higher studies in non engineering areas.

Table 5.16 Graduate Engineers Opting for Higher Studies Related to the Area of the Studies and Reasons for Joining Higher Studies: Branch Analysis

Branch of study	Area of higher studies				Reasons for joining higher studies							
	Related to engineering		Not directly related to the graduate engineering		Self Interest		No Job Opportunities		For career improvement		Motivation from others	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Civil and Architecture	13	100.0	0	-	13	100.0	0	-	0	-	0	-
Computer Science	17	43.6	22	56.4	30	76.9	1	2.6	2	5.1	6	15.4
Electrical and Electronics	23	69.7	10	30.3	26	78.8	2	6.1	5	15.2	0	-
Electronics and Communication	61	93.8	4	6.2	52	80.0	7	10.8	6	9.2	0	-
Information Technology	2	100.0	0	-	0	-	2	100.0	0	-	0	-
Mechanical	29	82.9	6	17.1	31	88.6	0	-	4	11.4	0	-
Others	29	78.4	8	21.6	29	78.4	6	16.2	2	5.4	0	-
Total	174	77.7	50	22.3	181	80.8	18	8.0	19	8.5	6	2.7

Source: Field survey

The reason for joining higher studies is analyzed in order to decipher the real factor prompting or pushing the students to pursue higher studies which shows that 80.8 per cent of the students have joined higher studies because of self interest and 8 per cent of the students have joined higher studies because of no job opportunities in their area of study. It is also observed that 8.5 per cent of the students have joined for higher studies in order to improve the opportunities of employment for better career and 2.7 per cent of the engineers have joined for higher studies as motivated from others.

Among the branches it is found that in the branch of civil and architecture all the students pursue higher studies because of self-interest whereas in the branch of computer science relatively less number of students joined higher studies because of self interest.

The students pursuing higher studies because of no job opportunities in their area of study is 8 per cent where the highest rate is in the branch of information technology as all the students have joined for higher studies in this branch due to no job opportunities. The facts shows that software, BPOs and ITES are employing 35 per cent of the passed engineers in their area of work and the engineers in the branch of information technology joining higher studies because of the lack of job opportunities is therefore, a contrasting remark. This phenomenon cannot be generalised as their representation in the sample is small in number.

The other factor motivating them for joining higher studies is the attitude of the students to enhance their opportunities for career growth by acquiring higher levels of knowledge. This is based on the belief that it ensures higher levels of income and earnings with better opportunities. It is found that 8.5 per cent of the engineers joined for higher studies to improve their career prospects which is highest in the branch of electrical and electronics.

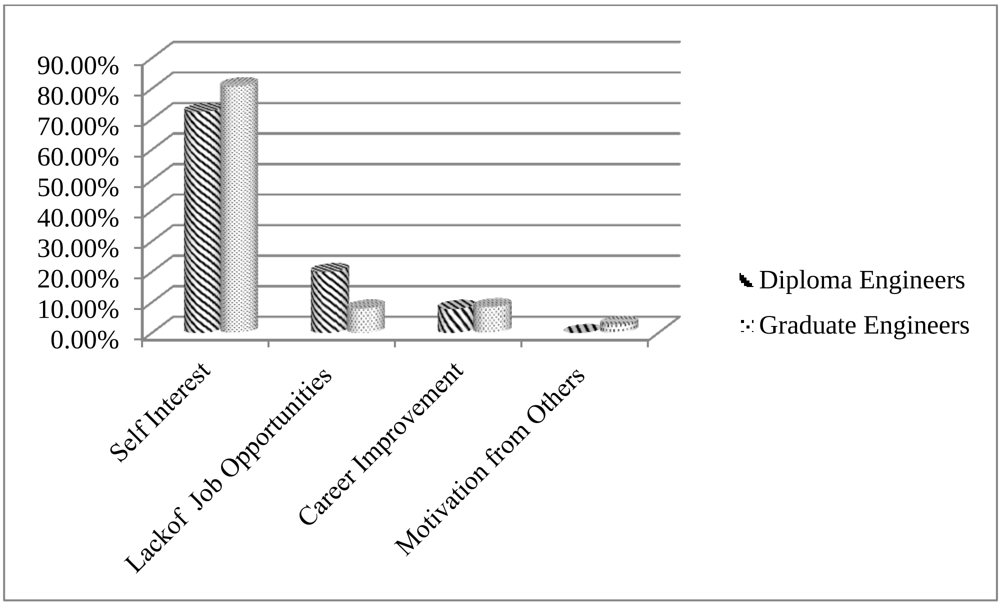

Figure 5.1 Reasons for Joining Higher Studies among the Diploma and Graduate Engineers

5.3.2 Engineers Opting for Higher Studies and the Reason for Joining Higher Studies- Their Gender Dimension

The engineers opting for higher studies and the reasons for joining higher studies is analyzed on the basis of their gender characteristics in order to understand the gender influence in determining the area of study and also to examine the reasons for pursuing higher studies among the gender groups. The strength of each factors varies among the diploma and graduate engineers.

From the table it is observed that among the diploma engineers more of the male diploma engineers have joined for higher studies related to engineering whereas among the graduate engineers more of the females have joined for higher studies that is directly related to engineering. Thus the earlier expectation of the female graduate engineers revealing their preference for the teaching job is now empirically found true.

It is also observed from the table that the male engineers joining for higher studies because of self-interest is greater than the females. At the same time more of the female diploma and graduate engineers join for higher studies because of no job opportunities which is greater than that of their male counterparts.

Table 5.17 Male and Female Engineers Opting for Higher Studies Related to the Area of the Studies and Reasons for Joining Higher Studies

Course and Gender	Area of higher studies				Reasons for joining higher studies							
	Related to engineering		Not directly related to engineering		Self Interest		No Job Opportunities		For career improvement		Motivation from others	
	No.	%	No.	%	No.	%	No	%	No	%	No.	%
Diploma												
Male	127	97.7	3	2.3	99	76.2	17	13.1	14	10.8	-	-
Female	53	86.9	8	13.1	39	63.9	21	34.4	1	1.6	-	-
Graduate												
Male	79	76.0	25	24.0	89	85.6	5	4.8	8	7.7	2	1.9
Female	95	79.2	25	20.8	92	76.7	13	10.8	11	9.2	4	3.3

Source: Field survey

Among the engineers who join for higher studies because of the need for career improvement it is found that the male engineers are more enthusiastic in the category of diploma whereas it is not observable among the graduate engineers. This is because the male graduate engineers get sooner employment with better offer which pulls them back from pursuing higher studies. The motivation as a factor of pursuing higher studies is more among the female graduate engineers.

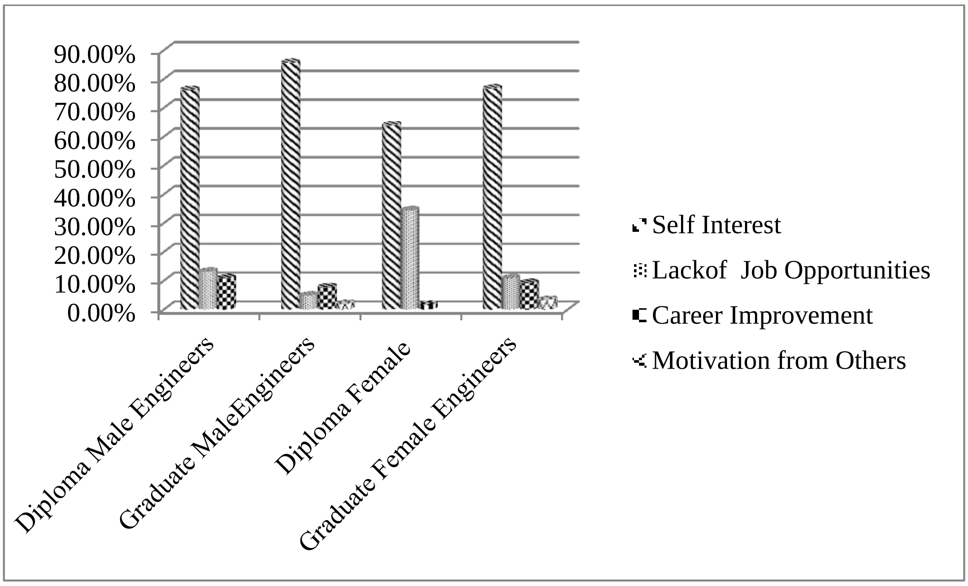

Figure 5.2 Reasons for Joining Higher Studies among the Engineers and Their Gender Characteristic

5.3.3 Engineers Opting for Higher Studies and the Reason for Joining Higher studies- Their Social Dimension

The engineers opting for higher studies are also examined on the basis of their social dimensions. The government policies are directed towards guaranteeing social justice which favour seat reservations for higher studies among the backward classes in government and aided colleges. The students belonging to this community materialize this opportunity and they are also encouraged to join higher courses by giving financial assistance in the form of scholarships in order to relax their financial hardships. As a result many of the engineers from the backward communities are expected to pursue higher studies.

The extent to which this opportunity is availed by the students of professionally qualified engineers while joining higher studies is examined here. The motive for joining such courses are also analysed among the various social groups.

Table 5.18 Engineers Opting for Higher Studies Related to the Area of the Studies, the Reasons for Joining Higher Studies and Their Social Category

Course and Social category	Area of higher studies				Reasons for joining higher studies							
	Related to engineering		Not directly related to engineering		Self Interest		No Job Opportunities		For career improvement		Motivation from others	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Diploma												
General category	70	93.3	5	6.7	53	70.7	16	21.3	6	8.0	-	-
OBC	95	95.0	5	5.0	75	75.0	18	18.0	7	7.0	-	-
SC and ST	15	93.8	1	6.2	10	62.5	4	25.0	2	12.5	-	-
Graduate												
General category	96	75.6	31	24.4	104	81.9	9	7.1	9	7.1	5	3.9
OBC	65	78.3	18	21.7	67	80.7	6	7.2	9	10.8	1	1.2
SC and ST	13	92.9	1	7.1	10	71.4	3	21.4	1	7.1	0	-

Source: Field survey

From the table it is understood that both among the diploma and graduate engineers relatively more of the backward students have joined for higher studies implying that the backward communities are largely benefitted from the policies of seat reservations for higher studies. But the reasons for joining higher studies do not reveal any specific trend as their responses are mixed when measured according to the degree of backwardness. But, irrespective of their social profile, majority of the engineers have joined for higher studies because of self- interest.

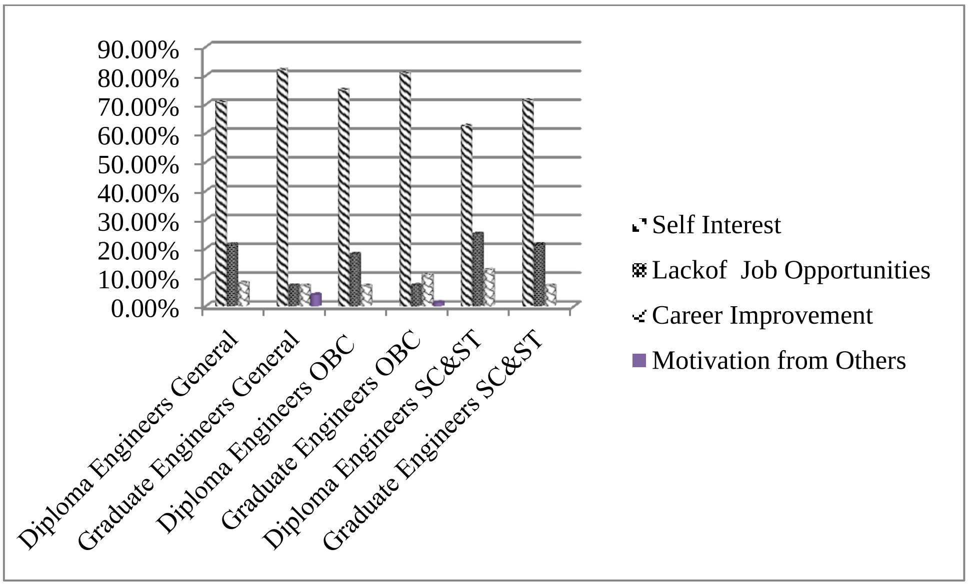

Figure 5.3 Reasons for Joining Higher Studies among the Engineers and Their Social Category

5.3.4 Engineers Opting for Higher Studies and the Reason for Joining Higher Studies- Comparison between the Rural and Urban Engineers

In India the deliberate initiatives taken by the various governments has narrowed the educational difference between the rural and urban population in recent years. The education system in India particularly in the state of Kerala because of the proactive role on the part of the government resulted in reducing the rural urban gap. The institutional spread in Kerala is characterized by even distribution of institutions in both rural and urban regions and there is no heavy concentration of institutions in urban areas. Hence it is argued that the rural folks in Kerala are not deprived of basic education. How far this equality prevails at professional level among the rural and urban population is a matter of interest and an attempt is made here to examine the rural-urban divide of the students joining for higher studies after diploma and graduate engineering.

Table 5.19 Engineers Opting for Higher Studies Related to the Area of the Studies, the Reasons for Joining Higher Studies and Their Area of Residence

Course and area of residence	Area of higher studies				Reasons for joining higher studies							
	Related to engineering		Not directly related to engineering		Self Interest		No Job Opportunities		For career improvement		Motivation from others	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Diploma												
Rural	126	94.7	7	5.3	97	72.9	25	18.8	11	8.3	-	-
Urban	54	93.1	4	6.9	41	70.7	13	22.4	4	6.9	-	-
Graduate												
Rural	106	78.5	29	21.5	110	81.5	8	5.9	13	9.6	4	3.0
Urban	68	76.4	21	23.6	71	79.8	10	11.2	6	6.7	2	2.2

Source: Field survey

From the table it is observed that both the rural and urban engineers joined for higher studies related to the field of engineering and strangely the rural enrolment is found higher than the urban. The motive for joining higher studies both among the rural and urban engineers is self interest. Among the diploma engineers, less job opportunity in their field of study is the next important factor pushing the engineers for joining higher studies which is found more among the urban. Among the graduates, the rural engineers joined for higher studies more because of the desire to improve their career prospects whereas among the urban engineers, less job opportunity is the next important factor.

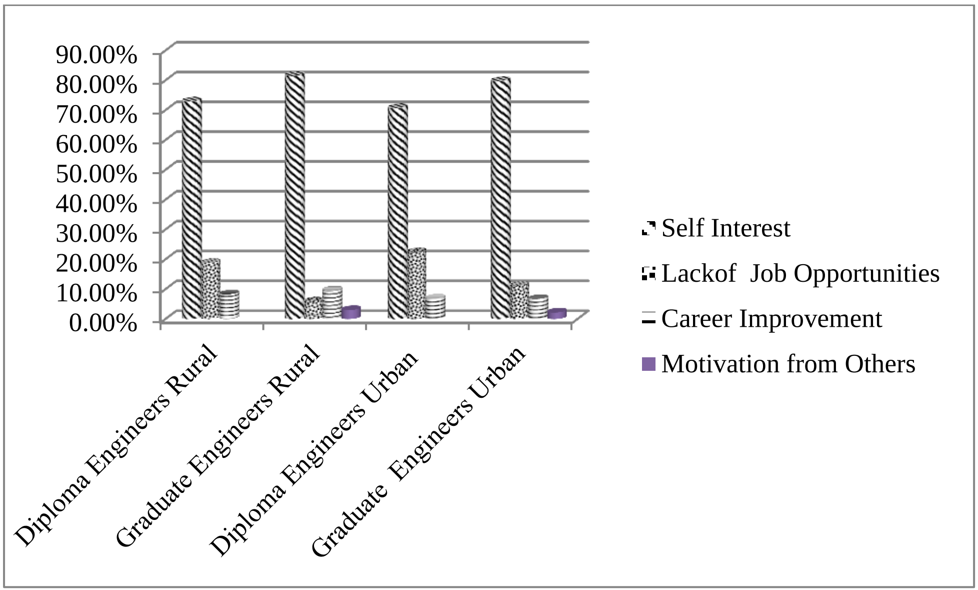

Figure 5.4 Reasons for Joining Higher Studies among the Engineers and Their Area of Residence

5.3.5 Engineers Opting for Higher Studies and the Reason for Joining Higher Studies- A Comparison Based on Their Levels of Parental Education

The levels of parental education are classified into low education level, mediocre level of education considered as educated and the rest are highly educated parents. The increase in the levels of parental education also increases the student's level of aspirations and motives because of the environmental factors. It is observed that many of the students who join professional education hails from the family of educated parents. The family conditions being favourable because of economic well off, therefore, do not push the students for immediate employment. Thus students of highly educated parents also enjoy greater economic freedom in pursuing higher studies. How the students pursuing higher studies are distributed based on their parental education is examined here.

Table 5.20 Engineers Opting for Higher Studies Related to the Area of the Studies, the Reasons for Joining Higher Studies and the Level of Parental Education

Course and level of parental education	Area of higher studies				Reasons for joining higher studies							
	Related to engineering		Not directly related to engineering		Self Interest		No Job Opportunities		For career improvement		Motivation from others	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Diploma												
Low Educated Parents	113	94.2	7	5.8	81	67.5	27	22.5	12	10.0	-	-
Educated Parents	41	91.1	4	8.9	37	82.2	7	15.6	1	2.2	-	-
Highly Educated Parents	26	100.0	0	-	20	76.9	4	15.4	2	7.7	-	-
Graduate												
Low Educated Parents	24	82.8	5	17.2	23	79.3	4	13.8	1	3.4	1	3.4
Educated Parents	36	85.7	6	14.3	39	92.9	1	2.4	2	4.8	0	-
Highly Educated Parents	114	74.5	39	25.5	119	77.8	13	8.5	16	10.5	5	3.3

Source: Field survey

From the table it is observed that among the diploma engineers more of the engineers whose parents are highly educated opt for higher studies related to the field of engineering whereas among the graduate engineers those who opt for higher studies is relatively more in the category of educated parents.

Irrespective of the level of parental education both diploma and graduate engineers go for higher studies because of self interest. It is also observed that among both the diploma and graduate engineers, those who opt for higher studies because of no job opportunities are more in the category of low educated parents. The graduate engineers opting for higher studies is expected to come from the highly educated parents. And the empirical facts shows that this argument is true when examined on the basis of the observation of the graduate engineers. The engineers opting for higher studies because of motivation from others in the category of low educated parents is a strange observation.

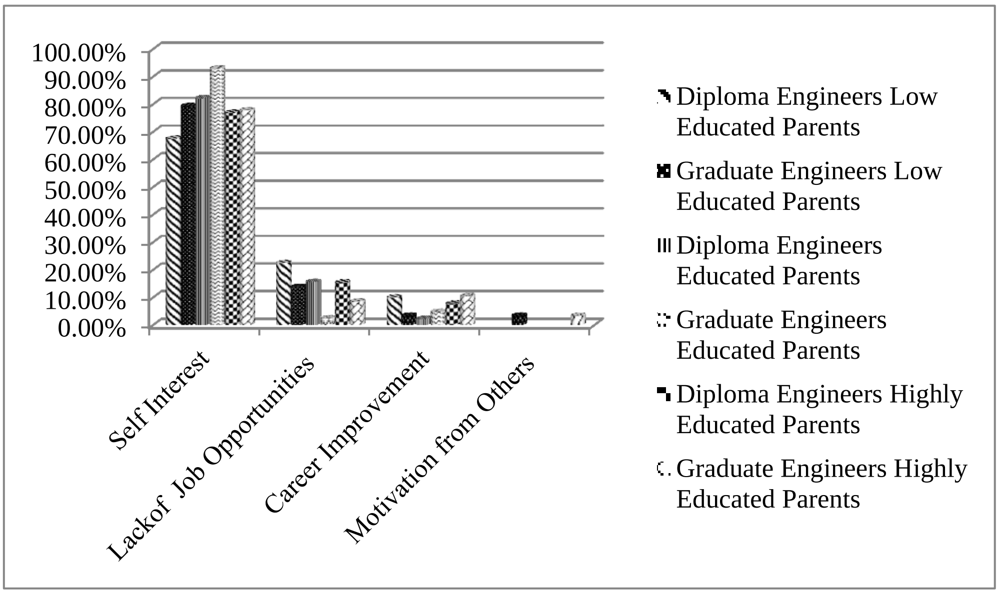

Figure 5.5 Reasons for Joining Higher Studies among the Engineers and Their Level of Parental Education

5.4 The Reasons for Joining Higher Studies among the Diploma and Graduate Engineers- Inferential analysis

The various factors that has motivated the engineers to pursue higher studies is also analysed with the help of chi-square test in order to know the prominent characteristics that is significantly influenced by the factors that determine the chance of pursuing higher studies. The summary of the result is given in the table 5.21.

Table 5.21 Reasons for Joining Higher Studies among the Engineers- Inferential Analysis

Course	Characteristics	Chi-square value	df	Sig.
Diploma	Branch	41.628	16	.000***
Graduate	Branch	65.593	18	.000***
Diploma	Gender/sex	14.776	2	.001***
Graduate	Gender/sex	3.621	3	.305
Diploma	Social category	1.344	4	.854
Graduate	Social category	6.171	6	.404
Diploma	Area of residence	0.391	2	.823
Graduate	Area of residence	2.531	3	.470
Diploma	Parental education	4.696	4	.320

*** significant at 1% level

The table of the chi-square results shows that the difference across the various characteristics for joining higher studies among the diploma and graduate engineers is significant only for the branch of study. For the diploma engineers the difference is also found significant on gender. On all other characteristics the degree of influence of the factors determining higher studies is statistically insignificant.

5.5 Findings and Conclusions

The academic achievement of the diploma and graduate engineers and their number pursuing higher studies for different reasons are analysed on the basis of their branch of study, their gender characteristics, their social background, their area of residence, type of institution of study and their level of parental education. It reveals some important and relevant facts

I Academic achievements

The branch-wise difference in the academic achievement among the diploma engineers is found significant but such difference is not significant among the graduate engineers.

Academically female engineers outperform their male counterparts but their difference is significant only among the diploma engineers and not among the graduate engineers.

Academically the backward communities are behind the forward communities and their difference is found statistically significant both among the diploma and graduate engineers.

Even if the urban engineers outperform the rural counterparts academically, their difference is found significant only among the diploma engineers and not among the graduate engineers.

The engineers from the government colleges are academically better-off than the other institutions but their difference is significant only among the graduate engineers.

The academic performance of the engineers is also determined by the level of parental education and the relation between them is positive. The influence of the level of the parental education on the academic performance of the students is also found significant.

II Students opting for higher studies and the reasons for joining higher studies among the diploma and graduate engineers.

Majority of the engineers joined for higher studies in the field of engineering and this is largely observed among the diploma engineers than the graduate engineers. This is primarily because the diploma engineers enjoy good opportunity of joining for a B.Tech. with large intake capacity. But for the graduate engineers the seats available in M.Tech. are comparatively less due to lower intake capacity and at the same time the graduate engineers also reveal their preference for employment.

The major reason for joining higher studies among both the diploma and graduate engineers is self-interest. The incidence of unemployment as a factor pushing the engineers to pursue higher studies is found more among the diploma engineers than the graduates.

The different factors that influence the engineers to join for higher studies is statistically significant among both the diploma and graduate engineers when classified on the basis of their branch of study. However this difference is also found significant between the genders but only among the diploma engineers.

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Chapter 6

THE PROBLEM OF UNEMPLOYMENT AND UNDEREMPLOYMENT AMONG THE ENGINEERS IN KERALA: ITS DIMENSION AND CAUSES

Contents

6.1 Introduction

Unemployment is one of the greatest challenges faced by the Indian economy. In its simplest thought unemployment even though is contemplated as an economic phenomenon requiring economic tools to combat it but in

India the social dimensions are prominent due to the presence of caste driven social forces. The problem exacerbates if its incidence is highly concentrated among a section of the society particularly the weaker and backward. The other apprehensions related to this problem is the existing difference in its magnitude across the parameters of the population classified on the basis of sex, region, locality, etc. and therefore, requires deliberate actions on the part of government to find concrete solutions. However the greatest difficulty in tackling unemployment is in identifying the real group of unemployed as there has been no generally accepted and standard measure of identifying the real victims of unemployment.

In India apart from the above problem, the presence of large number of agricultural labour characterized by the seasonal nature of work, the peculiarities of labour due to the participation of large number of women in family works add new dimensions to the problem in identifying those who are really employed and unemployed. Hence the unemployment characteristics of India are entirely different from other developed countries. Agencies like NSSO however attempts to scientifically estimate unemployment for various periods in order to understand the gravity of the problem and also to identify its nature on various aspects. The concept framed by NSSO is the base followed in identifying those who are unemployed and also in estimating the level of unemployment.

6.2 Unemployment and Underemployment: Its Meaning and Significance in Global and Indian Context

The theoretical debates of the thirties and the forties on unemployment gradually subsided and did not considerably influence the academic parlance in the early sixties because of the lower incidence of unemployment in the post war period postulating the success of Keynesian demand management technique. But in the US where the unemployment remained comparatively high there was a debate on the nature of unemployment whether it was structural unemployment requiring specific and supply side remedies or cyclical and remediable by a major expansion in the aggregate demand. Later in the UK also there remained the vestigial problem of relatively high unemployment in certain regions but generated a rather low key debate on its causes and remedies (Knight, 1986)[1]. Since then unemployment in most industrial economies has increased significantly and nowhere has this upward trend been more pronounced than in Britain. This led to a major revival of interest in the economics of unemployment. At the theoretical level the reappraisal of Keynesian ideas begun by Clower, (1965)[2] and Leijonhuvud (1968)[3] and the reemergence of interest in classical ideas led the way. As a result, the empirical work and interest in the appropriate policy response to high unemployment greatly increased. The gloomy forecasts of continuing and ever worsening unemployment in the 1980s have reinforced this revival of intellectual interest in the subject particularly on the magnitude of the problem.

6.2.1 The Problem of Underemployment

The term underemployment is often regarded as equivalent to disguised unemployment. The latter term was initially coined by Mrs. Joan Robinson to describe the situation in England during the 1930s in which persons who were

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[1] Knight, K. G. (1986).*Unemployment: An Economic Analysis.* Croom Helm Ltd.

[2] Clower, R. W. (1965). The Keynesian Counter-Revolution, A Theoretical Appraisal. In F. H. Brechling, *Theory of Interest Rates.* London: Macmillan.

[3] Leijonhuvud, A. (1968). *On Keynesian Economics and Economics of Keynes.* New York: Oxford University Press.

laid off from industries suffering from a lack of effective demand, took up inferior jobs, which did not really utilize their skills.

(Bornstein, 1978)[4]draws attention to the problem of underemployment when comparing unemployment in capitalist countries and socialist centrally planned economies. In the socialist countries the incidence of disguised unemployment carries significance resulting from the combination of ratchet principle in planning, tight labour market conditions and restrictions on the dismissal of worker. In fact, underemployment can be considered as an intermediate phase between employment and unemployment.

The underemployment as an issue of underutilization of the existing resources in its traditional sense in the context of developing economy refers to the situation when the productivity of labour in the agriculture sector is less than its potential capacity. But in its broader sense underemployment is not confined to agriculture sector only because in other sectors also there are large possibilities of labour contributing less than what he or she can. This situation of labour under-productivity is hard to measure but as suggested by Raj Krishna (1973) a person is called either as an unemployed man or underemployed man based on the criteria of time, income, willingness and productivity [5].

6.2.2 Unemployment and Underemployment: Its Meaning and Measurement in Indian Context

The generally acceptable definition of unemployment refers to someone (person) who has been taken as such (unemployed) after having applied unsuccessfully for a job and who after having registered with a government

[4] Bornstein, M. (1978). Unemployment in Capitalist Regulated Market Economies and Centrally Planned Socialist Economies. *American Economic Association.*

[5] Raj Krishna, Unemployment in India , *Economic and Political Weekly*, March 3,1973

agency responsible to find jobs for the job seekers, still finds no work (UNESCO,1991). Assuming that the job seekers remain idle and do not contribute towards production implies that there is ardent underutilization of the resources.

In India the underutilization of the existing manpower has deprived her the status of the developed economy and policy makers are striving to resolve this problem of unemployment to accelerate the pace of economic growth and development. The underutilization of the existing manpower is to be specifically defined in order to state the condition of unemployment in each category of the labour force classified on the basis of their level of education, their gender, their social status, the region, and their economic condition.

The question of the measurement of the stock of unemployment indicating the degree of underutilization of labour in the economy is difficult for India because of the wide rural and urban divide. The measure of underutilization assumes that the unemployed are wholly unemployed and the employed are fully utilized and if the employed are not working to their full capacity then they are considered as underemployed which is another form of unemployment. It is possible to count the number of unemployed persons on any one day but the number of totally or chronically unemployed is difficult to estimate because in a predominantly agricultural economy, only a few persons remain unemployed for a long period of time. This makes the problem of the measurement of unemployment in India more complex.

Again within the ranks of the unemployed, it is important to distinguish between those who have never worked before identified as the new entrants into the job market and those who have worked before. In the urban areas the former constitute a majority of persons classified as unemployed but in the rural areas they form a small proportion of the total because it is not difficult to take up some work when one wants it (Myers, 1958).[6]

In rural areas because of the intermittent movement of the labour force from employment to unemployment status, the rate of unemployment is low if considered in terms of the time of unemployment. Dovring, (1967) has therefore, suggested that an attempt might be made to specify labour norms in terms of some kind of time elements rather than non time element and through work studies an attempt might be made to study the difference between the time spent and time needed in order to measure disguised unemployment prominently observed in rural areas[7]. Sinha (1968) proposed the measurement of time units of unemployment as the difference between the time units for which a labourer is available for work and the time duration of actual work, weighted by the ratio of average daily wage rate and a standard wage rate which would be adequate to meet the minimum nutritional requirements and other basic needs[8].

In 1954 the Research Program Committee of the Planning Commission sponsored socio economic surveys of more than 20 cities and it suggested that unemployed should include persons who had no job on a given day or during a given period and who were seeking work and are able to take up a job if offered one (Jal, 1964)[9]. The term job implies that persons having some casual

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[6] Myers, C. A. (1958). *Labour Problems in the Industrialisation of India.* Cambridge: Harvard University Press.

[7] Dovring, F. (1967, January). Unemployment in Traditional Agriculture, Economic Development and Cultural Change. *Economic Development and Cultural Change*, *15*(2), 163-173.

[8] Sinha, J. N. (1968). The Concept of Unemployment in Developing Economy. *Indian Journal of Agricultural Economics*, *23*(2), 15-24.

[9] Jal, F. B. (1964). *Problems of rapid urbanisation in India.* Bombay: Popular Prakashan.

work but not a steady job would be classified as unemployed if they were seeking full-time work and in some surveys the unemployed were defined as persons who were gainfully employed or were not earning and were actively seeking employment or a source of earning (Chand, 1969)[10] and (Rao, V K R V; Desai, P B, 1965)

The urban unemployment is different from the rural unemployment in its nature and form and therefore the CSO standards for the classification of urban areas adopted in 1961 and followed by the NSS since its 16th round are somewhat restrictive. The unemployed in urban areas must be looking for full time work. Also persons not seeking but available for work or those aged less than 14 or more than 60 are not included among the unemployed.

Another important issue relating to the measurement of urban unemployment is the wide divergence between the number of unemployed estimated through the urban labour force surveys and the number of persons registered with employment exchanges. Since the exchange does not cover all the urban centres, the observed discrepancies understate the difference. It has been pointed out that the two sets of data are basically non-comparable. It seems that the number of job-seekers registered with exchanges can be best interpreted as indicating the felt pressure for additional income and demand for better, stable or more stable jobs (Dantwala, 1980)[11].The NSS work approach however, considers a person as employed if employed for at least one day during the reference week.

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[10] Chand, M. (1969). *Employment and Migration in Allahabad city.* New Delhi: Oxford & IBH Publishing Co.

Rao, V K R V; Desai, P B. (1965). *Greater Delhi: A study in urbanisation,1940-57.* Bombay: Asia Publishing House.

[11] Dantwala. (1980). *Annual Report 1979-80.* New Delhi: Planning Commission, Govt of India.

The actual measurement of the magnitude of the problem of unemployment for a particular case is, therefore, based on the nature of unemployment observed and other characteristics of the target group among whom the unemployed is to be identified.

6.2.3 The General Causes of Unemployment

The causes of unemployment are different depending on the nature and the structure of the economy and the stage of development the economy is passing through. Many explanations are forwarded that define the particular cause of unemployment in an economy. For instance the cause of unemployment in the developed economy is due to the lack of effective demand as per the Keynesian proposition but such may not be true in the case of the developing economy. Less developed countries are bound to suffer from what Joan Robinson has called Marxian unemployment as distinct from Keynesian unemployment; it is not the lack of aggregate demand but the lack of capital in relation to the size of the labour force that basically accounts for mass unemployment in the third world (Blaug, 1974)[12].

In the third world countries, the excessive consumption by the privileged classes is also identified as one of the causes of unemployment. It must, therefore, be realized that inordinate consumerism, combined with the maintenance of archaic agrarian structure has undermined the capacity of the labour markets to cope with the demands for employment resulting from the rural exodus and from natural urban population growth.

[12] Blaug, M. (1974). Education and the Employment Problem in Developing Countries. (S. B. Jones-Hendrickson, Ed.) *Social and Economic Studies*, *23*(4), 638-41.

Apart from that, the social and technical changes, methods of production which are closely linked with progress, have led to more unemployment in developing countries like India. In some extreme cases unemployment is also perpetuated as a result of structural changes effectively introduced through trade liberalization when the public sectors are closed down or either laid off resulting in huge army of the unemployed.

It cannot be forbidden that the economic growth is the most necessary condition for ensuring employment thus supporting the proposition that growth and employment are complementary and not conflicting ends. This is true only when integrated action is taken avoiding creation of dual system out of development by using the resources in a more scientific, systematic and economic way through proper distribution of resources according to the required social justice and again executed and implemented by the government in power with strong determination because of their political will. Growth must therefore, be understood as an effort to increase and transform investments by enhancing and extending the mechanism of social integration and participation. In this sense, unemployment is also the result of poor growth.

The unemployment in the developing countries to a larger extent also depends upon the structure and composition of the labour force. The composition of the labour force in the rural and urban areas is different and hence rural and urban unemployment differ. The problem of unemployment in the rural areas is more staggering in dimension caused due to higher concentration of labour force in rural areas. Similarly the difference in the composition of the labour force between male and female and their unique characteristics influenced by social factors also determine the intensity of the problem of unemployment. In countries like India with female population more in the role of housewives, particularly in the rural areas they do not form a part of the labour force and therefore the revealed strength of female unemployment in rural areas is an underestimation of the actual figures.

The difference in the rate of unemployment between the educated and the uneducated is the another important and live issue relevant for developing countries. With the given conditions and situations the scope of employment increases with the level of education because this enables diversification of opportunities available to the potential seekers of employment. But education by itself does not ensure employment and the hypothetical proposition that unemployment is the result of lack of education in developing countries is disproved with growing incidence of educated unemployment in the recent years in countries like India. The growth of educated unemployment poses a new challenge for India as the apprehensions grow owing to the varied characteristics of unemployment evident within this group.

6.3 Educated Unemployment and Underemployment – Challenges for India

The growth of the educated unemployment in India is a matter of high concern as the youth constitutes a large chunk of the population and the new entrants to the job market bear the larger brunt of the unemployment problem. Youth unemployment is much higher than general unemployment almost everywhere. The youth unemployment is high not merely due to the non availability of job but because education and information raise their aspirations. Hence they are likely to develop reservations about certain kinds of jobs which they perceive as menial or just manual and do not accept for employment leading to the growth of unemployment among the educated.

The growing youth unemployment is one of the great causes of discontentment among them because an educated and informed young person looks at unemployment as exclusions from the society and a denial of the right to participate in the developmental activities of the society. The young are also temperamentally and psychologically more vulnerable. Keeping the young reasonably occupied and interested in social progress is a big challenge that confronts societies everywhere in the world (Higgins,1997) cited in (Hashim, 2000)[13]. It is also accepted that the educated unemployed is a dangerous person. He is vocal; he has influence: he nurses a sense of personal injury and if the grievance is long, continued and large in numbers as in India the situation is decidedly explosive and will be a constant threat to the security and stability of the state because the unemployed persons belonging to this category are not dump, driven cattle but intelligent people and will not accept an unenviable position lying down.

It is also widely recognized that if educated people have to remain idle, then the scheme of things responsible for such a state of affairs deserves strong condemnation. It involves the waste of the best of our human resources. It means a great national loss that such a valuable human capital should stand idle. If the history of employment is traced, it is found that the unemployment among the intellectual and clerical or soft handed workers constituting the so called middle class has been prevalent ever since the twentieth century. Middle class unemployment became rather acute after the First World War particularly during the period 1920-37. The problem of the middle class unemployment has increased very much in recent years. But still the greatest

[13] Hashim, S. R. (2000). Employment and Unemployment in a Society of Transition. *Indian Journal of Labour Economics, 43*(2), 8-17.

attention in India is received on the Keynesian type of unemployment where lack of aggregate demand is the major cause of unemployment in developed countries. There are types of unemployment that do not correspond to the Keynesian type particularly the incidence of educated unemployment observed among the highly educated which is not of Keynesian nature.

The high rate of unemployment among the professionally educated and technically qualified personnel further adds to the agony among the educated unemployed because the youth fail to choose a career of professional education guaranteeing employment. This undermines the very prospects of technical education in India set with the objective of developing indigenous skilled personnel necessary for the upgrading of technology in production. If the present technically qualified personnel fail to get prosperous employment opportunities it necessarily affects the quality of future technical personnel. The technically qualified unemployed personnel are the highly skilled engineers consisting of both the diploma and graduate engineers who fail to find prosperous careers in engineering. The problem is grave as the state of unemployment among the higher epitome of the educated population will gradually transfer to the lower stages of education leading to mass unemployment also among the uneducated. This is because of the bumping down effect where the highly educated get the first employment and the incidence of unemployment is felt more among the less educated. This is the famous bumping down theory of Fields[14]. The same theoretical proposals are advanced in the Job Ladder Model of Bhagwati and Srinivasan indicating the transfer of unemployment to the lower strata in the hierarchy of the level of education.

[14] Fields. Opcit.

An economy witnessing the issue of unemployment among the technical labour force indicates the failure of the government in utilizing the existing skilled resources of the economy.

6.4 The Dimensions of the Problem of Engineering Unemployment and Underemployment in India

A common research conclusion is that the utilization of scientists and engineers is marked by underemployment and misemployment. Skills and talents are underutilized and misdirected. Management priorities, structure and organization detract from technical performance. Assigned tasks are narrow and repetitive, more appropriately performed by an individual with a much lower level of technical training. Of course, the degree of underemployment and misemployment varies among work organizations. But the generalized conclusion is that in the society at large, the latent productive capacity of scientists and engineers is not being drawn out in majority of our work organizations due to misallocation (Kenneth, 1981)[15].

The problem of unemployment among the engineers in India is not an incidence of recent times but this phenomenon of unemployment resulting from planning flaws is evident from the 1960s either due to slowdown of the economic growth or due to disproportionate expansion of the institutions beyond the capacity of absorption. For instance the Director General of Technical Development estimated the number of graduate engineers unemployed in December 1966 at 4000 and 16000 for the diploma holders at national level. It is opined that this unemployment situation is bound to worsen, until there is a general revival in the intermediate and capital goods

[15] Kenneth, A. O. (1981, January). Scientists, Engineers and the Organizationof Work. *American Journal of Economics and Sociology, 40*(1), 51-66.

sectors of the economy and the likely rate of unemployment among the graduate engineers in the year 1970 is 14000 and for the diploma holders it is 67000 for the same period. The number of unemployed engineers must double or triple by the year 1971 but the firm cut of say 30-40percent in the new admissions from 1968 can prevent a surplus becoming a glut(Angus, 1968)[16].

In India, in order to estimate the level of unemployment among the technically qualified, the Government of India has set up the National Technical Manpower Information System in 1984 with a Lead Centre located in the Institute of Applied Manpower Research with 21 Nodal Centres located at state level which is entrusted with the responsibility of collecting information regarding various aspects of technical education in the respective states from three respondent groups, viz. fresh engineering graduates and diploma holders, engineering educational institutions and establishments which employ engineers. The data collected from these respondents throws up a variety of information on the development and utilization of engineering and technical manpower at the national and state level. The information generated in the NTMIS is disseminated through the Annual Technical Manpower Reviews published annually for each state and the consolidated facts at National level are given in the 'Manpower Profile'. The Manpower Profile published as India Year Book 2008 by the Institute of Applied Manpower Research shows that the unemployment level among majority of the states is increasing for the period 2001 to 2005. The increase in the rate of unemployment is more among the graduate engineers than the diploma engineers. It is only among few states such as Delhi, Jammu and Kashmir where unemployment is found declining both among the graduate and diploma engineers over a period.

[16] Angus, Hone. (1968, April). Unemployed Engineers. *Economic and Political Weekly, III*(15).

6.5 The Incidence of Engineering Unemployment and Underemployment in the State of Kerala

The state of Kerala is known for its literacy and educational achievements compared to other parts of India but the economic growth of the state does not correspond to the high growth of education, resulting in educated unemployment of serious proportion. This fact is substantiated by a study on urban unemployment in Kochi city in the state of Kerala that reveals a high incidence of unemployment due to the nature of the labour market characterized by informal and casual employment and the low participation of the educated labour force in informal and casual activities. The other factors leading to the growing unemployment in the city of Kochi are the excess of educated labour force on the one side, the small size and low growth of the organized sector leading to a small demand for regular employment on the other resulting in high incidence of unemployment among youth. Owing to severe unemployment, the young and educated labour force is forced to migrate to other parts of India and abroad for employment (Prakash, 2002)[17]. The case of high rate of unemployment even in the commercial capital of Kerala thus reveals that the growth of educated unemployment is a phenomenon requiring serious and immediate attention in Kerala. The growth of technical education in the state of Kerala with the mushrooming of the self financing colleges in the engineering stream since the year 2000 further worsened the problem of existing engineering unemployment by producing a large army of unemployed technical force and it is a disgrace for the state of Kerala known for its educational achievements and human development index.

[17] Prakash, B. A.(2002, September 28). Urban Unemployment in Kerala: The case of Kochi city. *Economic and Political Weekly, 37*(39), 4073-78.

6.5.1 Engineering Unemployment in Kerala: Data Analysis

The engineering unemployment in Kerala is analyzed based on both the secondary and primary data. The secondary data source is mainly the NTMIS report of Kerala published in the Annual Technical Manpower Review Report for the years 1984 to 2008 and also the other available supporting documents of Manpower Profile, NTMIS Bullettin and information obtained from Supervisory Development Centre, Kalmassery of Apprenticeship Trainees, etc.

6.5.1.1 Engineering Unemployment in Kerala-Analysis of the Secondary data

The extent of unemployment among the diploma and graduate engineers in Kerala during the period 2000 to 2008 is obtained from the NTMIS reports of Kerala and it reveals a stunning growth of unemployment. The frequent ups and downs in the rate of unemployment among the engineers indicate an upward trend of unemployment among the graduates whereas for the diploma holders it indicates a downward trend.

Table 6.1 Rate of Unemployment among the Diploma and Graduate Engineers (Year 2000 to 2008)

Year	Rate of unemployment among the diploma engineers	Compound Annual Growth rate	Rate of unemployment among the graduate engineers	Compound Annual Growth rate
2000	29.60	-	12.18	-
2001	29.66	0.20	12.82	5.25
2002	34.90	8.58	15.73	13.64
2003	38.27	8.94	18.07	14.05
2004	42.11	9.21	16.48	7.85
2005	35.30	3.58	8.1	-7.83
2006	29.77	0.10	8.4	-6.00
2007	26.86	-1.38	7.1	-7.42
2008	25.24	-6.03	30.51	12.16

Source: Data compiled from the NTMIS Report 2000 to 2008, Lead Centre Kerala (based on one to one correspondence between batch of study and employment status of the year)

The data of the unemployment among the diploma and the graduate engineers thus indicates a higher incidence of unemployment both among the diploma and graduate engineers. The rate of unemployment among the diploma engineers is found to be greater than the graduate unemployment in all years but in the year 2008 the unemployment rate of the graduates is over that among the diploma engineers. This erratic jump in unemployment rate among the graduate engineers brought the issue of unemployment among the engineers to the centre stage of discussions, particularly under the condition of graduate unemployment scaling new heights of 30 per cent during the year 2008.

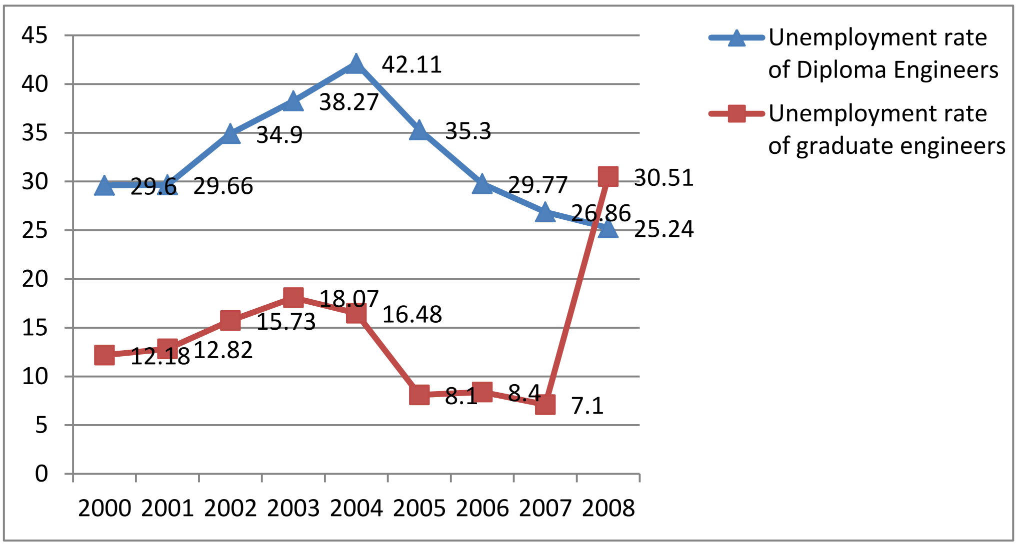

Figure 6.1 Unemployment Rate of Diploma and Graduate Engineers (Year 2000 to 2008)

The rate of unemployment is also transformed into the compound annual growth rate which indicates both positive and negative rates over the periods for both the diploma and graduate engineers but in the end as in the year 2008 the compound annual growth rate of unemployment of the diploma engineers is -6.03 indicating a negative growth whereas for the graduate engineers in the period the compound annual growth rate is 12.16 indicating a very high positive growth.

6.5.1.1.1 Engineering Unemployment in Kerala among the Diploma Holders and Graduate Engineers and Their Branch of Study: Analysis of Secondary Data

The engineering education in Kerala started with the inception of the College of Engineering, Trivandrum in the year 1939 at the graduate level. However imparting of engineering education at the diploma level started in the year 1946 at Kozhikode with the establishment of Kerala Government Polytechnic College. The engineering education is imparted in different branches of study and each branch has its own characteristics with some branches gaining more popularity because of large employment opportunities, whereas the others are least preferred due to their sluggish demand in the labour market. It is again observed that on account of the precarious nature of the labour market the employment opportunities for each branch of study vary over a period of time. The unprecedented changes in the labour market have their own repercussions in the system of engineering education. The difference in the employment opportunities in each branch of study is analyzed for both the diploma holders and graduate engineers to know the prospects of employment in each branch. The analysis is done to predict the employment opportunities to identify the popular courses of study.

Unemployment rate among the diploma holders: The rate of unemployment among the diploma holders based on the NTMIS reports of Kerala for the period 2000 to 2008 is computed based on the one to one correspondence between the batch of study and year of passing. The data is then analyzed among the various branches of study which are arranged in such a way that the related branches are combined together and the rest are considered as others as done in the previous analysis.

Table 6.2 Unemployment Rate among the Diploma Engineers and Their Branch of Study (Year 2000 to 2008)

Branch	Unemployment rates									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	CAGR
Civil, Architecture and related branches	36.66	27.66	39.48	40.88	50.73	31.29	31.01	26.93	17.97	-8.53
Commercial Practice	50.92	52.94	36.84	44	28	43.44	35.92	39.39	20.15	-10.94
Computer Engineering	21.95	29.65	28.28	31	33.6	31.31	27.89	26.45	38.21	7.17
CABM, Computer Hardware Maintenance and IT	16.22	33.43	32.34	23.01	29.35	34.92	27.81	20.62	33.75	9.59
Electrical	21.96	27.91	32.40	36.25	42.43	42.28	27.43	23.56	17.87	-2.54
Electronics and Applied Electronics	34.82	37.05	34.71	41	48.7	40.55	30.93	34.86	29.2	-2.18
Electronics and Communication and other related	18.18	34.8	29.00	49.14	50.52	42.33	38.04	31.04	34.53	8.35
Mechanical	23.90	26.42	36.16	38.14	41.19	34.64	26.11	22.63	16.03	-4.87
Others	28.07	22.60	36.38	31.93	39.20	29.69	30.00	21.25	21.53	-3.26
Total	29.60	29.66	34.90	38.27	42.11	35.30	29.77	26.86	25.24	-1.97

Source: Data compiled from the figures of Annual Technical manpower Review (based on one to one correspondence between batch of study and employment status of a year)

The Table 6.2 shows the unemployment rate of the diploma engineers across various branches of study during the period 2000 to 2008 estimates. The compound annual growth rate of unemployment shows that for some branches there is a negative growth of unemployment, whereas for others the growth is positive. Among the branches the compound annual growth rate of unemployment indicates a possible high rate of growth of unemployment in the branch of CABM, CHM and IT whereas the trend of unemployment rate is least in the branch of Commercial practice. The overall growth of unemployment among the diploma engineers also indicates a negative growth rate implying that the incidence of unemployment among the diploma engineers is declining.

Unemployment rate among the graduate engineers: Like the diploma engineers, the engineering graduates who fail to get employment after completing their course of study are also treated as unemployed. The unemployment rate among the various branch of study for the period 2000 to 2008 is transformed into compound annual growth rate which shows that it is the highest in the branch of computer science and it is the least in the branch of mechanical engineering.

Table 6.3 Unemployment Rate among the Graduate Engineers and Their Branch of Study (Year 2000 to 2008)

Branch of study	Unemployment rates									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	CAGR
Civil and Architecture	15.49	19.26	26.86	27.74	27.59	15.58	12.92	11.05	19.28	2.77
Computer Science	3.35	6.19	6.2	11.2	9.21	6.58	4.07	4.26	41.91	37.14
Electrical and Electronics	15.25	16.34	17.33	17.44	20.77	7.76	9.14	6.68	36.95	11.70
Electronics and Communication	7.17	9.25	8.74	17.89	11.31	6.39	5.49	8.04	40.51	24.17
Information Technology				23.29	6.38	17.78	0	2.93	41.97	12.50
Mechanical	16.79	12.72	16.75	17.81	13.54	7.5	7.41	6.29	19.58	1.94
Others	5.2	7.89	13.84	15.93	18.89	5.41	14.7	8.72	25.5	21.99
Total	12.18	12.82	15.73	18.07	16.48	8.1	8.4	7.1	30.51	12.16

Source: Data compiled from the figures of Annual Technical Manpower Review Reports NTMIS Lead Centre Kerala (rates based on one to one correspondence between batch of study and employment status of a year)

The table 6.3 also shows that the compound annual growth rate of unemployment among the graduate engineers in all the branches of study is positive indicating an upward trend of unemployment among the graduate engineers.

The high growth of unemployment among the graduates confirms that graduate unemployment is growing over the period whereas the unemployment among the diploma engineers is declining gradually.

6.5.1.1.2 Rate of Unemployment among the Diploma and Graduate Engineers for the Period 1984 to 2008 -Trend Analysis

The rate of unemployment among the diploma engineers and the graduate engineers in Kerala during the period 1984 to 2008 is analyzed among the various branches of study by exponential growth and a regression value is obtained to estimate the trend of unemployment.

Trend analysis of the unemployment among the diploma engineers (1984-2008)

The time series analysis of the unemployment rates among the diploma engineers for the period 1984-2008 is done. In order to find the pattern of the trend we first fit the linear trend and exponential trend and the model summary is given in the following table

Table 6.4 ANOVA Table of the Model of Diploma Engineers

Type	Equation	Model Summary				
		R Square	F	df1	df2	Sig.
Diploma	Linear	0.452	8.24	1	10	0.017
	Exponential	0.47	8.873	1	10	0.014

From the table R square is more for exponential model. The trend is found to be exponential we therefore, find out the exponential growth rate of the data which is exhibited in Table 6.5.

Table 6.5 Exponential Growth Rate of Unemployment among the Diploma Holders

Year	Civil and Architecture	Commercial Practice	Computer	CABM,CHM and IT	Electrical	Electronics and Applied Electronics	Electronics and Communication and related	Mechanical	Others
1984	49.54	61.76	NA	NA	51.18	31.43	50	37.58	51.82
1985	49.24	55.56	NA	NA	45.96	34.02	0	47.88	42.37
1987	52.79	45.45	NA	NA	55.99	42.96	52	40.63	49.24
1988	46.97	42.42	NA	77.63	44.65	41.55	14.81	39.04	47.06
1992	7.69	61.39	23.64	NA	45.41	43.9	0	32.04	31.84
1995	49.72	61.06	34.09	11.63	32.25	41.51	0	33.61	30.47
1996	37.02	48.05	23.81	18.42	36.26	38.63	0	30.43	28.27
2000	36.66	50.92	21.95	16.22	21.96	34.82	18.18	23.9	28.07
2001	27.66	52.94	29.65	33.43	27.91	37.05	34.8	26.42	21
2002	39.48	36.84	28.28	36.86	32.4	34.71	29	36.16	35.04
2003	40.45	37.14	31	32.18	36.25	41	49.14	38.14	29.48
2004	50.73	42.11	33.6	27.73	42.43	48.7	50.52	41.19	39.46
2005	33.54	46.81	34.03	36.38	44.36	42.14	42.26	34.64	27.24
2006	31.01	35.92	27.89	27.81	27.43	30.93	38.04	26.11	31.41
2007	26.93	39.39	26.45	20.62	23.56	34.86	31.04	22.63	20.63
2008	17.97	20.15	38.21	33.75	17.87	29.2	34.53	16.03	23.71
EG	-2.9	-4.2	2.37	0.05	-4.8	-0.6	-2.81	-3.8	-4.1

Source: Data computed from the NTMIS reports for the period 1984 to 2008

From the table it can be concluded that except in the branches of Computer Engineering and CABM, IT, etc. all other branches reveal a declining trend in the rate of unemployment among the diploma engineers.

The trend estimated values for the various branches can be used for comparison by drawing graphs and finding out the pattern of trend which is given in Table 6.6.

Table 6.6 Regression Value of the Unemployment Rate of Diploma Engineers (in %)

Civil and Architecture	Commercial Practice	Computer Science	CABM, CHM & IT	Electrical	Electronics and Applied Electronics	Electronics and Communication and related	Mechanical	Others
46.94	59.20	-	-	48.90	39.38	20.19	41.54	43.01
45.66	57.45	-	-	47.27	39.19	21.42	40.42	41.56
44.38	55.71	-	-	45.63	39.00	22.65	39.30	40.10
43.10	53.97	-	29.32	43.99	38.81	23.88	38.18	38.65
41.82	52.22	25.63	29.21	42.35	38.62	25.11	37.06	37.19
40.54	50.48	26.31	29.10	40.71	38.43	26.34	35.94	35.74
39.26	48.74	27.00	28.99	39.07	38.25	27.57	34.83	34.28
37.98	46.99	27.68	28.88	37.44	38.06	28.80	33.71	32.83
36.70	45.25	28.36	28.78	35.80	37.87	30.03	32.59	31.37
35.42	43.50	29.04	28.67	34.16	37.68	31.26	31.47	29.92
34.14	41.76	29.72	28.56	32.52	37.49	32.49	30.35	28.46
32.86	40.02	30.41	28.45	30.88	37.30	33.72	29.23	27.01
31.58	38.27	31.09	28.34	29.24	37.12	34.95	28.11	25.55
30.29	36.53	31.77	28.23	27.61	36.93	36.18	26.99	24.10
29.01	34.78	32.45	28.12	25.97	36.74	37.41	25.87	22.64
27.73	33.04	33.13	28.01	24.33	36.55	38.64	24.75	21.19

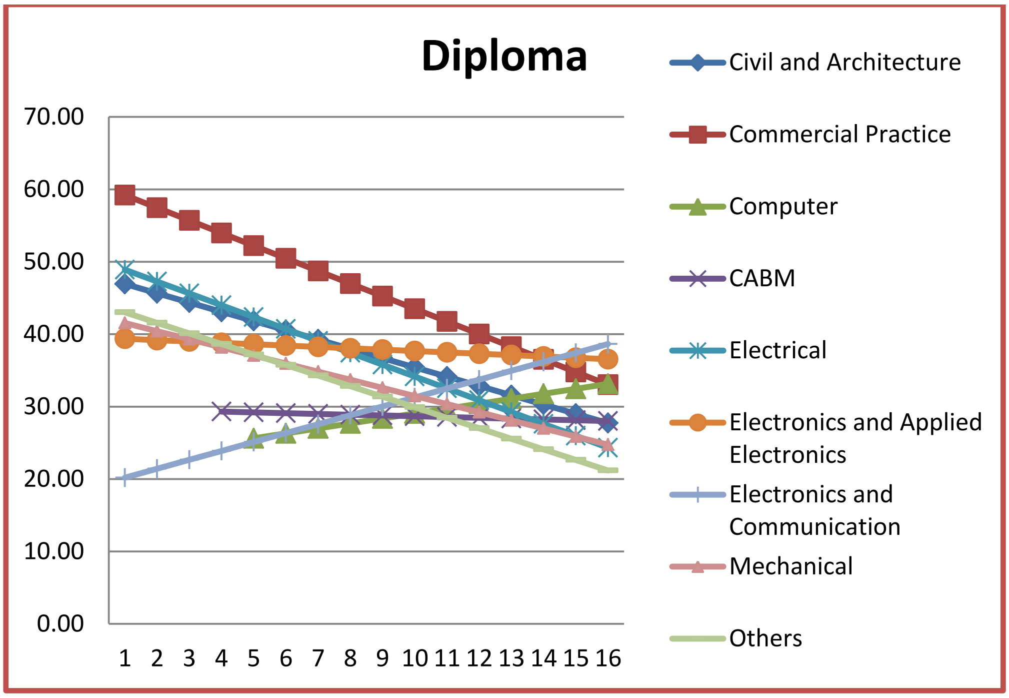

Figure 6.2 Regression Curves of the Estimated Trend of Unemployment Rates among the Diploma Engineers and Their Branch of Study

From the figure it is implied that the rate of unemployment among the diploma engineers is declining in the majority of the branches of study as the period progresses except in the branches of computer engineering and also in the branch of electronics and communication. Thus it can be concluded that the electronics and communication and also computer engineering at diploma level is likely to be more affected due to unemployment which will affect the popularity of the branch.

The increase in the rate of unemployment among the diploma engineers is in the branch of electronics and communication is explained by the fact that there was a natural decline in the electronic industry in the post liberalization period in India. This was mainly because of China and other countries gaining global markets of electronic products because of their comparative cost advantage. Similarly the boom in the IT and software industry has not benefitted the computer engineers having only diploma in engineering.

Trend analysis of the unemployment among the graduate engineers (1984-2008)

The time series analysis of the unemployment rates among the degree engineers for the period 1984-2008 is also done in order to find the pattern of the trend. We, therefore, first fit the linear trend and exponential trend and the model summary is given in the following table:

Table 6.7 ANOVA Table of the Model of Graduate Engineers

Type	Equation	Model Summary				
		R Square	F	df1	df2	Sig.
Diploma	Linear	0.732	10.898	1	4	0.030
	Exponential	0.767	13.188	1	4	0.022

From the table R square is more for exponential model. As the trend is found to be exponential we find out the exponential growth rate of the data and is exhibited in Tables

The exponential growth of unemployment shows that it is the highest in the branch of Computer and it is least for the branch of Information Technology, which shows a negative trend.

Table 6.8 Exponential Growth Rate of Unemployment among Graduate Engineers

Year	Civil and Architecture	Computer	Electrical and Electronics	Electronics and Communication	Information Technology	Mechanical	Others
1984	15.89	NA	14.51	4.84	NA	3.39	2.17
1985	31.89	NA	16.62	-	NA	13.39	10
1987	32.99	NA	16.22	1.28	NA	12.64	11.9
1988	25.18	NA	22.56	3.13	NA	13.06	15.32
1992	28.55	NA	20.91	16.23	NA	20.59	15.27
1995	26.54	3.39	25	21.59	NA	14.09	10
1996	15.31	4.68	16.14	7.22	NA	10.24	10.96
2000	15.49	3.35	15.25	7.17	NA	16.79	5.2
2001	19.26	6.19	16.34	9.25	NA	12.72	7.89
2002	26.86	6.2	17.33	8.74	NA	16.75	13.84
2003	27.74	11.2	17.44	17.89	23.29	17.81	15.93
2004	27.59	9.21	20.77	11.31	6.38	13.54	18.89
2005	15.58	6.58	7.76	6.39	17.78	7.5	5.41
2006	12.92	4.07	9.14	5.49	0	7.41	14.7
2007	11.05	4.26	6.68	8.04	2.93	6.29	8.72
2008	19.28	41.91	36.95	40.51	41.97	19.58	25.5
EG	3.5	12.09	-2.3	8.68	-9.35	0.74	4.86

The following tables give the trend estimated values for the various branches which can be used for comparison by drawing graphs and to find out the pattern of trend

Table 6.9 Regression Value of the Unemployment Rate of Graduate Engineers (in %)

Civil and Architecture	Computer	Electrical and Electronics	Electronics and Communication	Information Technology	Mechanical	Others
27.41	-	17.89	4.25	-	12.56	8.22
26.69	-	17.84	5.13	-	12.60	8.72
25.97	-	17.78	6.02	-	12.64	9.22
25.25	-	17.73	6.90	-	12.68	9.72
24.53	-	17.67	7.79	-	12.72	10.22
23.81	0.24	17.62	8.67	-	12.76	10.73
23.09	2.03	17.56	9.56	-	12.80	11.23
22.37	3.82	17.50	10.45	-	12.84	11.73
21.65	5.61	17.45	11.33	-	12.88	12.23
20.93	7.40	17.39	12.22	-	12.92	12.73
20.21	9.19	17.34	13.10	10.73	12.96	13.24
19.49	10.98	17.28	13.99	12.59	13.00	13.74
18.77	12.76	17.23	14.87	14.46	13.05	14.24
18.05	14.55	17.17	15.76	16.32	13.09	14.74
17.33	16.34	17.11	16.64	18.19	13.13	15.24
16.61	18.13	17.06	17.53	20.05	13.17	15.74

The branch of civil and architecture shows a declining trend in the rate of unemployment among the engineers and is a fact when considered in terms of its popularity over a period. There was a period when aspiring engineering candidates least preferred civil engineering and it was the choice of those in the lower ranks in the common entrance examination. But with the progress of time, in order to meet the targets of economic growth, the country required heavy infrastructure projects. This resulted in a big demand for engineers and therefore civil engineering is now considered a popular branch also because of its good scope for self- employment.

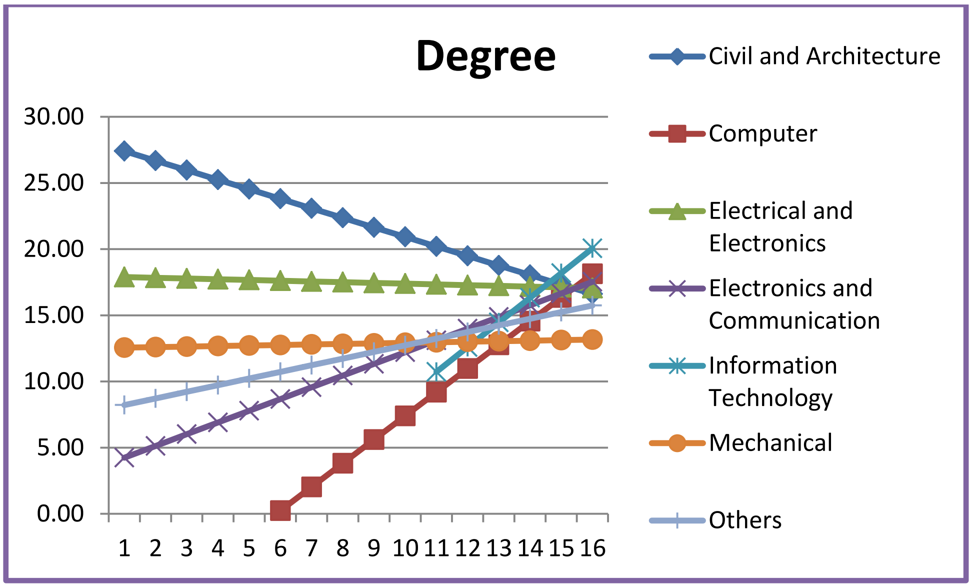

Figure 6.3: Regression Curves of the Estimated Trend of Unemployment Rates among the Graduate Engineers and Their Branch of Study

The branch of electrical and electronics however records a steady rate of unemployment as per the trend value implying that the industry has not recorded a tremendous growth during the period or because there is lowering employment elasticity in the sector.

6.5.1.2 Engineering Employment, Underemployment and Unemployment in Kerala: Descriptive Analysis of the Primary data

Based on the analysis of secondary data the experts argue that the problem of engineering unemployment in Kerala is very grave and therefore it needs serious attention. But the extent to which the problem is evident among the engineers is to be substantiated with the help of primary data. Hence an attempt is made to estimate the level of employment, underemployment and unemployment among the diploma and graduate engineers in Kerala and the difference in the level based on their branch of study, their gender characteristics, the type of institution of study, their area of residence, etc. is analyzed with the help of primary data.

6.5.1.2.1 Engineering Employment, Underemployment and Unemployment among the Diploma and Graduate Engineers: Their Branch of Study

The engineering employment, underemployment and unemployment among the diploma and graduate engineers is examined to know their differences and the also to know the degree of influence of the branch of study in determining the level of employment.

The employed here are really employed in the sense that they are able to gain an income at least above the average of the entire engineers in their group and also an income above the average of the income as drawn by the engineers in their respective branches. The underemployed are those who do not draw an income above these averages. The unemployed are those who are not in employment for the majority of time after passing the course and remain at least unemployed for thirty days at the time of reporting during survey.

The diploma engineers and their branch of study

The rate of real employment of the diploma holders is an indication of the potential utilization of technical personnel in productive areas. Thus the level of real employment is that proportion of the labour force which is able to gain income at least above the average salary of the engineers in total and in their respective branch of study. The underemployed engineers on the other hand are those who contribute towards output less than their potential level. The proxy of measurement of underemployment is the income criterion which means that if the productive capacity of an engineer is less they will also be rewarded at a lower rate. Thus underemployed are those whose average salary is less than that of the mean salary of the engineers in that particular branch and also less than that of the mean salary of the diploma engineers in total whichever is less. The rate of unemployment on the other hand refers to those engineers who fail to find regular employment and are therefore forbidden the opportunity of contributing towards the national product even though they are willing to take up employment if they are offered on opportunity.

The problem of underemployment prevailing among the engineers is now a major issue as a large outturn of the engineers with unmatched requirement in the labour market has increased the bargaining capacity of the employers and the pressure of downward pull of the wages is high. As a result the normal hike required for sustenance among the labour is not ensured. Thus it leads to the deteriorating working condition of the present and also future engineers. The increased supply of the engineers has paved the way for exploitative practice on the part of the employers. The extent of underemployment prevailing among the engineers in Kerala is examined here.

The discipline-wise difference in the level of employment, unemployment and underemployment is analyzed to examine whether the difference in these rates is attributed to the branch of study or due to other factors. The discipline-wise data in total reveals that the highest rate of unemployment at the diploma level is in the branch of Telecommunication Technology where 71.5 per cent of the engineers are unemployed. Similarly the rate of underemployed is high in the branch of Printing Technology. As the engineers in many of the branches represent only small numbers, conclusions cannot be generalised (see Appendix VI Table 6.1).

However as in the earlier analysis the branches of study related to the area of study are clubbed to form a cohort so as to avoid their insignificance due to miniscule representation. Thus the employment, underemployment and unemployment existing among the diploma engineers in the nine branches of study are examined to know their differences.

The primary data collected by the investigator based on the sample survey when arranged in new form reveals that the highest rate of employment is in the branch of mechanical whereas the highest rate of underemployment and unemployment is in the branch of commercial practice.

Table 6.10 Employment, Underemployment and Unemployment Rate of the Diploma Engineers and Their Branch of Study

Branch of Study	Employed engineers		Underemployed engineers		Unemployed engineers		Total Passed Engineers
	No.	%	No.	%	No.	%	No.
Civil, Architecture and related branches	12	15.0	30	37.5	17	21.3	80
Commercial Practice	0	0.0	10	45.5	10	45.5	22
Computer Engineering	9	10.0	29	32.2	21	23.3	90
CABM, Hardware maintenance and IT	3	6.0	17	34.0	19	38.0	50
Electrical	8	11.1	25	34.7	15	20.8	72
Electronics and Applied Electronics	10	9.0	25	22.5	41	36.9	111
Electronics and Communication and other related	3	5.0	14	23.3	19	31.7	60
Mechanical	14	17.5	25	31.3	19	23.8	80
Others	9	9.1	36	36.4	33	33.3	99
Total	68	10.2	211	31.8	194	29.2	664

Source: Field Survey

Thus the observations in the secondary data of lower unemployment rate among the mechanical engineers and high employment among them in the primary data reveal the fact that the mechanical diploma engineers have good employment prospects in the job market created by a boom in the automobile industry where a large number of diploma engineers are working in the manufacturing and also in automobile servicing sector.

The high rate of underemployment existing in the branch of commercial practice is primarily because none are really employed as the employed draw an income less than the average of the income of the engineers in total.

The graduate engineers and their branch of study: The growth of the engineering colleges and the larger outturn of graduate engineers at a greater pace than the growth of new opportunities of job lead to wide unemployment among the graduate engineers particularly after the year 2000.

The branch-wise analysis of the employment, underemployment and unemployment among the graduate engineers is an attempt to decipher whether the branch of study is a determining factor of unemployment and underemployment among the graduate engineers in Kerala.

The branch wise data as obtained from the sample survey in total shows that the largest rate of unemployment is in the branch of instrumentation and control and the largest rate of underemployment is in the branch of marine engineering if individual branches with independent identities are considered and there are branches where the rate of unemployment and also underemployment is zero(see Appendix VI Table 6.2).

Table 6.11 Employment, Underemployment and Unemployment Rate of the Graduate Engineers and Their Branch of Study

Branch of Study	Employed engineers		Underemployed engineers		Unemployed engineers		Total Passed Engineers
	No.	%	No.	%	No.	%	No.
Civil and Architecture	16	17.4	43	46.7	20	21.7	92
Computer Science	60	25.9	74	31.9	59	25.4	232
Electrical and Electronics	26	12.9	110	54.5	33	16.3	202
Electronics and Communication	18	6.2	149	51.2	59	20.3	291
Information Technology	23	25.8	41	46.1	23	25.8	89
Mechanical	34	20.9	73	44.8	21	12.9	163
Others	23	13.7	69	41.1	39	23.2	168
Total	200	16.2	559	45.2	254	20.5	1237

Source: Field survey

The branch of study is then rearranged to form a combined group as in other analysis shows some facts based on the primary data. It is observed that the highest rate of real employment and also unemployment is in the branch of computer science. The highest rate of underemployment is in the branch of electrical and electronics. It is also found that due to the larger variation in the level of monthly income 45.2 per cent of the engineers are identified as underemployed, which is considerably a large figure.

Thus the observations of highest unemployment prevailing among the engineers in computer science are substantiated because both the primary and the secondary data observations reveal the same fact. The relative high rate of unemployment existing in the branch of computer science is because of the penetration of employment opportunities availed in the information technology and software by other branches of study. The engineers in the branch of computer science are most affected as they are less privileged to have other employment avenues.

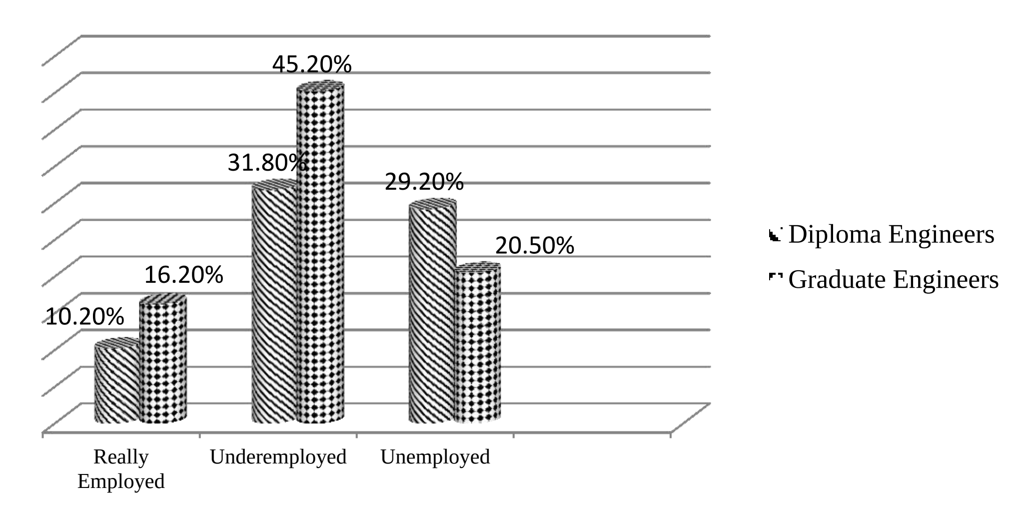

Figure 6.4 Employment Status of the Diploma and Graduate Engineers

The underemployment of the engineers higher than employed is an indication of the proportion of the engineers who are remunerated relatively less compared to the average monthly salary of the total engineers or in their respective branch of study.

The incidence of underemployment is prevalent more among the graduate engineers whereas the rate of unemployment is low among the graduates as compared with the diploma holders. It also implies that the graduates have higher job opportunities than the diploma engineers as there is employment in areas other than their specialization. But the wide disparities in income render many of the graduate engineers underemployed.

6.5.1.2.2 Engineering Employment, Underemployment and Unemployment among the Diploma and Graduate Engineers in Kerala: Their Gender Features

The workforce in any economy consists of both the male and female workers. Unlike the other parts of the world the social fabric in India is structured in such a way that the orthodox attitude prevents certain categories of workforce from being occupied in forbidden employment areas due to their gender character. Thus the early traditional societies forbade women to be employed totally and men were considered to be the sole bread winner of the family. This stricture against women in the workforce also led to their poor education and lack of acquisition of necessary skills for employment for centuries. The social attitude changed only with the advent of social reformation movement in India which inducted new and broad ideas in favour of women which was backed by the supportive legislations initiated during the British rule and further strengthened in the post-independence period. The outcome had been the gradual increase in the enrolment of female in education, coupled with their growth in the workforce. Even if this process continues for a long period, women folk still have inhibition in taking up employment in areas which require professional skill of a technical nature. Hence the enrolment of women engineers is not only abysmally low but the employers are also sceptical about the ability of the female engineers in acquiring and delivering engineering skills, thereby badly affecting the prospects of employment of female engineers. The damage done in the labour market due to this discrimination is analyzed for both the diploma and graduate engineers in Kerala.

The employment, underemployment and unemployment features when observed among the diploma and graduate engineers across their gender features reveal that relatively more of the male engineers are employed. The rate of underemployment among the males is higher than the females among the graduates only whereas the rate of unemployment is relatively high among the females both in the category of diploma and graduate engineers. Similarly between the diploma and graduate engineers it is found that the rate of employment and underemployment is high among the graduate engineers, whereas the rate of unemployment is high among the diploma engineers.

Table 6.12 Employment, Underemployment and Unemployment among the Male and Female Engineers in Kerala

Course of study and gender	Employed Engineers		Underemployed		Unemployed		Total Passed Engineers
	No.	%	No.	%	No.	%	No.
Diploma engineers							
Male	59	14.1	130	31.1	99	23.7	418
Female	9	3.7	81	32.9	95	38.6	246
Graduate engineers							
Male	136	21.1	309	48.0	95	14.8	644
Female	64	10.8	250	42.2	159	26.8	593

Source: Field survey

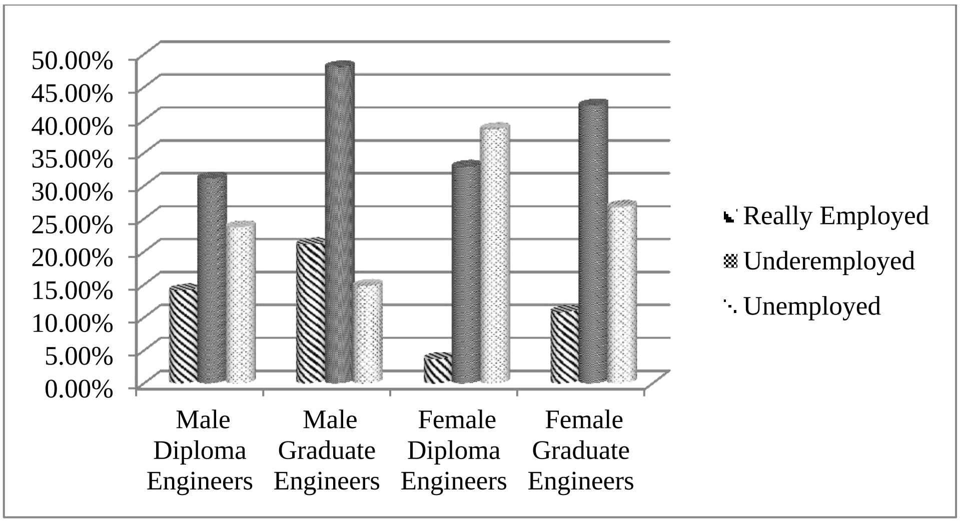

Figure 6.5 Employment Status of the Engineers and Gender

The male employed engineers being higher than the females show that the male engineers are privileged to have good job opportunities. At the same time their higher underemployment also indicates that many of them are working under poor conditions with below standard wages. The female underemployment is low under such conditions as they are not ready to take up those jobs with low remunerations and working conditions not favourable and hence prefer to remain unemployed rather than being underemployed.

6.5.1.2.3 Engineering Employment, Underemployment and Unemployment among the Diploma and Graduate Engineers in Kerala: Their Social Background

The social background of the individual also influences the prospects of employment in India due to its unique social base and structure. In India the students belonging to the backward classes are deprived of the basic education and their absence in the professional education due to poor enrolment is highly observable with low enrolment and academic underachievement and later with low employment absorption. The inequality and social injustice faced by the socially backward classes has been the area of great concern for social researchers. An attempt is made towards inclusive policies where the students belonging to socially deprived classes are encouraged to join the professional courses through the policy of seat reservation for this category of students at the entry level and job reservation in the government and public sector at the stage of seeking employment.

In Kerala owing to its unique social structure the replication of the features at the all India level is unlikely to occur in same form and magnitude because the state of Kerala is out of the dormant stage of education due to early implementation of educational reforms. But whether such advantage is witnessed at the employment level among the professionally qualified engineers is a matter of concern for the policy makers and hence the unemployment and underemployment of the diploma engineers in Kerala on the basis of their social category is examined here for detailed analysis.

The data on the employment characteristics of the diploma engineers shows that the highest rate of employment is among the engineers belonging to the general category. The rate of underemployment is high among the engineers belonging to scheduled castes and tribes whereas the rate of unemployment is found more among the engineers belonging to the other backward classes.

At graduate level also the rate of employment is high among the engineers belonging to the general category whereas both the underemployed and unemployed is found to be relatively high among the engineers belonging to the other backward classes.

The rate of employment and underemployment is relatively high among the graduate engineers when compared with the diploma engineers, but the rate of unemployment is relatively high among the diploma engineers.

Table 6.13 Employment, Underemployment and Unemployment among the Diploma and Graduate Engineers and Their Social Category

Course and Social background of the Engineers	Employed Engineers		Underemployed		Unemployed		Total Passed Engineers
	No.	%	No.	%	No.	%	
Diploma engineers							
General category	22	11.3	46	23.6	52	26.7	195
OBC	43	10.4	144	34.8	127	30.7	414
SC and ST	3	5.5	21	38.2	15	27.3	55
Graduate engineers							
General category	120	19.2	277	44.4	100	16.0	624
OBC	71	13.0	255	46.5	139	25.4	548
SC and ST	9	13.8	27	41.5	15	23.1	65

Source: Field survey

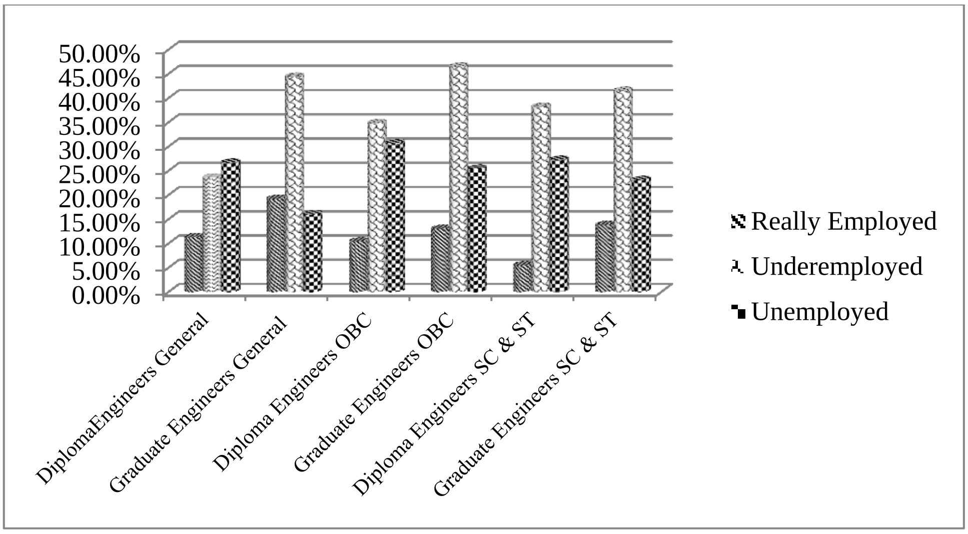

Figure 6.6 Employment Status of the Engineers and Their Social Category

The high rate of employment in the general category both among the diploma and graduate engineers is because of the preference for the forward communities prevailing in highly remunerated professional jobs. But considering the rate of underemployment and unemployment as high among the engineers belonging to the scheduled caste and tribe and also among the other backward classes it indicates that the real victims of deprivation in the engineering labour market are the engineers who belong to the backward community in Kerala.

6.5.1.2.4 Engineering Employment, Underemployment and Unemployment among the Diploma and Graduate Engineers in Kerala and Their Area of Residence

The other factors that influence the individual in the pursuit of his career is the area of residence categorized on the basis of rural and urban characteristics. The rural urban divide in India is more prominent due to the unique nature of development. The urban students being privileged to have good institutional support and other supportive facilities display a greater leap ahead of the students from the rural background in their career growth and the rural students lacking such an impetus fail to reach on a par with the urban students in their career. The newly available avenues of employment for engineering are denied to the rural students because they demand greater skill in communication, particularly in English where the rural students are lagging far behind their urban counterparts. The divide among the rural and urban population is likely to grow with that stage of education requiring higher level of knowledge and skill which is largely influenced right from the inception of knowledge imparted at the school level. Apparently, the enrolment of rural population at the higher levels of learning particularly at the professional level is low. But owing to reservation based on social categories and its higher concentration in the rural areas, the main stream of professional education is also represented by a satisfactory level of rural population in Kerala.

The centralized admission procedure adopted for entry into the professional education has widened the scope for the large mass of the rural population into the professional education. This however does not ensure the quality of the outturn of the rural students and thereby the absorption of these engineers in the labour market. Hence it is essential to analyze whether the rural engineers are discriminated or not in the labour market.

Table 6.14 Employment, Underemployment and Unemployment among the Diploma and Graduate Engineers and Their Area of Residence

Course and Area of Residence	Employed Engineers		Underemployed		Unemployed		Total Passed Engineers
	No.	%	No.	%	No.	%	No.
Diploma engineers							
Rural	53	10.5	166	32.9	152	30.2	504
Urban	15	9.4	45	28.1	42	26.3	160
Graduate engineers							
Rural	112	14.4	360	46.2	173	22.2	780
Urban	88	19.3	199	43.5	81	17.7	457

Source: Field survey

The data of the employment, underemployment and unemployment among the diploma engineers shows that the rate of employment, underemployment and also unemployment is high among the rural engineers.

If we consider the level of employment, underemployment and unemployment among the graduate engineers it is observed that the rate of employment is high among the urban engineers but both the rate of underemployment and unemployment is high among the rural engineers. The magnitude of rural urban difference in terms of employment in Kerala is more evident among the engineering graduates than the diploma engineers.

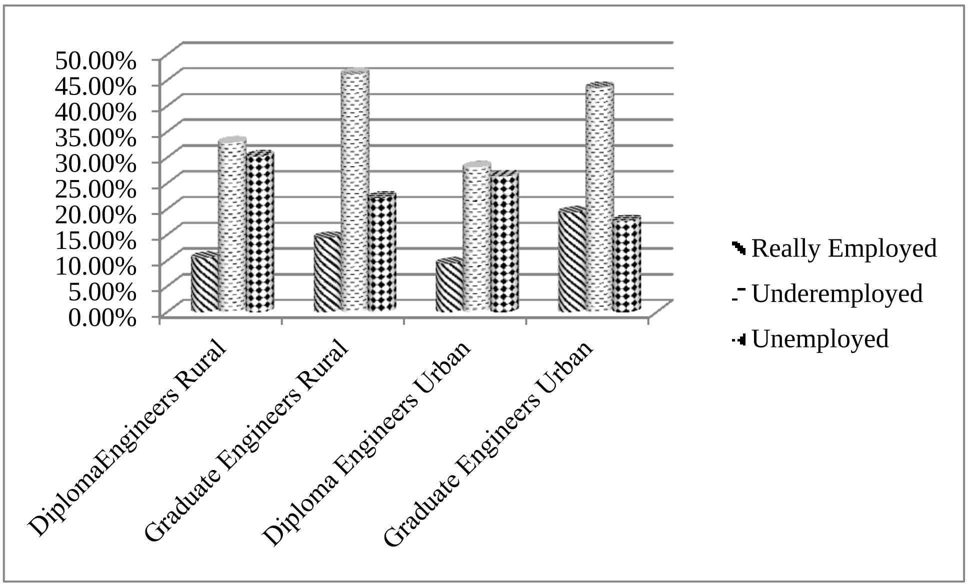

Figure 6.7 Employment Status of the Engineers and Their Area of Residence

But a clear rural urban divide is explicitly absent in Kerala which indicates the uniqueness of demographic conditions existing in Kerala different from the rest of India because of its peculiarities of development.

6.5.1.2.5 Engineering Employment, Underemployment and Unemployment among the Diploma and Graduate Engineers in Kerala and Their Institution of study.

It is apparent that among the various institutions, viz. government owned institutions, private aided colleges and private unaided institutions, there are wide differences among them in the quality of education to the infrastructure and other facilities available to the students. This difference has widened with the upcoming of the new self-financing institutions. The pace of growth of the engineering institutions has been tremendous during the period 2000 to 2014. At the graduate level there were only 36 institutions in total during the year 2000 and now as in the year 2014 it has increased to 161 but at the diploma level the institutions have increased from 55 in the year 2000 to 64 in the year 2014. The engineering degree colleges outnumbered the polytechnic institutions since the year 2002 and the unchecked growth of the degree institutions in Kerala has its wider ramifications in the employment market. As a result of the disproportionate growth of the engineering graduate degree holders in Kerala, the employment market will also witness large incidence of unemployment among the diploma engineers due to the bumping down effect where the employers prefer those with higher qualification due to their redundancy in supply.

The difference in the rate of unemployment among the institutions is more evident particularly when the institutions have taken a proactive role in giving placement to the passed students through the placement cells arranged by these institutions. Thus, institutions act as a link between the employer and job seeking students. This difference in the scope of employment among the institutions is known and explicitly expressed by students while revealing their preference for joining a course in an institution. In this way at the graduate level of engineering, the College of Engineering, Trivandrum is the best engineering college as a state institution. The TKM College Kollam, Govt engineering College Thrissur, M A Engineering College Kothamangalam, Govt Engineering College Barton Hill Thiruvananthapuram, Model Engineering College Thrikkakara are the other dearer colleges of the best engineering students(Rajsenan D Sunitha A S and Binu Paul, 2009)[18].

The extent to which the difference arises in the scope of employment among the diploma and graduate engineers across the various types of institutions is examined and discussed for analysis.

Table 6.15 Employment, Underemployment and Unemployment among the Diploma and Graduate Engineers and the Type of Institution of Study

Course and type of institution	Employed Engineers		Underemployed		Unemployed		Total Passed Engineers
	No.	%	No.	%	No.	%	No.
Diploma engineers							
Govt College	54	10.4	176	34.0	154	29.7	518
Private Aided College	9	7.7	28	23.9	32	27.4	117
Private Unaided College	5	17.2	7	24.1	8	27.6	29
Graduate engineers							
Govt College	111	20.2	240	43.6	94	17.1	550
Private Aided College	23	19.3	60	50.4	14	11.8	119
Private Unaided College	66	11.6	259	45.6	146	25.7	568

Source: Field survey

[18] Rajsenan D Sunitha A S and Binu Paul. (2009). Professional Course Entrance Examination in Kerala: Exclusion in a Community Gender Mirror. In D. Rajasenan and Binu Paul (Ed.), *Social Exclusion & Technical Education in Kerala* (pp. 54-83). Directorate of Public Relations and Publications, CUSAT.

The diploma engineers studying in various types of institutions of study show that the highest rate of employment is among the students of private unaided colleges whereas the highest rate of underemployment and unemployment is among the engineers from government college. The poor performance of the government colleges at the diploma level is mainly attributed to the low quality of intake in polytechnic institutions which has largely affected the government colleges with high proliferation of academically weak students as the good students prefer joining B.Tech. after their higher secondary courses rather joining a diploma in engineering. This preference is revealed because a B.Tech. degree in engineering widens their scope of employment in other areas also. The informal discussion with the faculty members in government polytechnics colleges revealed their dissatisfaction with the academic conditions prevailing in a majority of these institutions and they are not worthy enough to attract good students. But the overall supervision by the private managers in private aided institutions helps them for better performance.

If we examine the level of employment, underemployment and unemployment among the graduate engineers, it is observed that the highest rate of employment is among the engineers from government college. The highest rate of underemployment is among the engineers from private aided college and highest rate of unemployment is among the engineers from private unaided college. Thus the favourable conditions prevailing in government colleges at graduate level is not available in government diploma colleges.

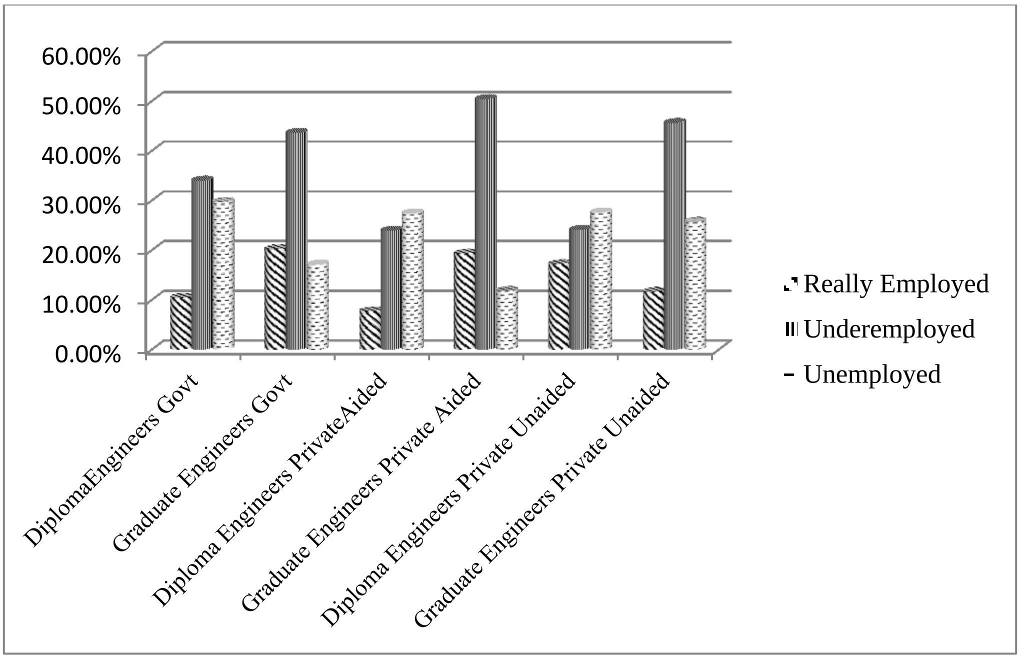

Figure 6.8 Employment Status of the Engineers and Type of Institution of Study

The high rate of underemployment prevailing in the engineering education in all types of institution signifies that even if engineers are employed, majority of them are underemployed working with low income and are accepting employment to keep the status of being employed as intact for some time.

6.5.1.3 Engineering Employment Underemployment and Unemployment in Kerala: Inferential Analysis of the Primary data

The difference in the level of employment, underemployment and unemployment is examined in order to know whether the difference is significant or not among the engineers classified on various characteristics based on the chi-square results. The results are given in table 6.16.

Table 6.16 Inferential Analysis of the Employment Status of the Diploma and Graduate Engineers

Course of Study	Characteristics	Chi-square value	df	Sig.
Diploma	Branch Total	49.415	52	0.576
Graduate	Branch Total	113.012	50	0.000***
Diploma	Branch combined	25.176	16	0.067*
Graduate	Branch combined	63.869	12	0.000***
Diploma	Gender	27.081	2	0.000***
Graduate	Gender	44.034	2	0.000***
Diploma	Social background	4.780	4	0.311
Graduate	Social background	19.341	4	0.001***
Diploma	Region	6.599	4	0.159
Graduate	Region	3.193	4	0.526
Diploma	Area	0.018	2	0.991
Graduate	Area	7.381	2	0.025**
Diploma	Type of institution	3.042	4	0.551
Graduate	Type of institution	29.357	4	0.000***

***significant at 1% level ,**significant at 5% level and * significant at 10% level

The above table shows that the difference in the levels of employment both among the diploma and graduate engineers is significant across the branches of study and their gender character. For the graduate engineers the difference is significant further based on their social background, the area of residence of engineers and the type of institution of study.

6.6 Factors Determining Unemployment of the Engineers: Analysis of the Primary Data Based on Logistic Regression

One of objectives of the study is to identify factors which contribute positively to the employment rather than unemployment of the engineering graduates and diploma holders in Kerala. The logistic regression is used for this purpose.

Initially log likelihood of the model was developed for the given dependent and independent variables and significance of the model was tested at p=0.05 level. Further statistical significance of all the individual predictor variables/factors is conducted by means of likelihood ratio tests at 0.05 levels. Multinomial logit models were developed by using the coefficients (column B) in the parameter estimates. While developing the multinomial logit models the reference category/base group was taken as Unemployed. The odds ratios Exp (B) for each independent variable are also computed. All the analysis was conducted by means of software SPSS-20.

The ratio of the probability of choosing one particular category is often referred to as relative risk (and it is also sometimes called as odds). The parameter estimates give the odds ratio of the independent variable at 95% confidence interval. The improvement in dependent variable due to unit increase in the independent variable is explained by means of the log odds and odds ratio for that independent variable obtained during the analysis. The analysis is carried out separately for graduates and diploma holders.

Logistic regression of the diploma engineers: Initially log likelihood model was developed. The initial log likelihood value obtained is 352.189, which is a measure of a model with no independent variable, that is only constant or intercept. The final log likelihood value obtained is 342.601 and this is a measure of a model by considering all independent variables. The difference between these two measures is the model chi-square value which is obtained as 9.588 and this is not significant.

Table 6.17 Log likelihood ratio tests of Diploma Engineers

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	352.189			
Final	342.601	9.588	7	.213

Table 6.18 Beta values of the Factors Determining Unemployment of Diploma Engineers

		B	Exp(B)	95% Confidence Interval for Exp(B)	
				Lower Bound	Upper Bound
Employed	Intercept	3.713			
	Social Category	.084	1.087	.688	1.718
	Area of Residence	-.324	.723	.396	1.321
	Monthly Income of the family	.051	1.052	.731	1.514
	Type of the Institution	-.237	.789	.485	1.282
	Branch	.032	1.033	.939	1.135
	Parental Education	-.327	.721	.450	1.154
	Academic qualification	-.036	.964	.930	1.000

The reference category is: Unemployed

The multinomial logit model shown in the table gives the following regression equations

Log (p(employed)/p(unemployed) = 3.713 + 0.084 Social Category -0.324 Area of Residence +0.051 Monthly income -0.237 Type of Institution + 0.032 Branch -0.327 Parental Education -0.036 Academic qualification.

The other way of interpreting the result is based on the Exponential beta. Exponential beta gives the odd ratio of the dependent variable. We can find the probability of the dependent variable from this odd ratio. When the exponential beta value is greater than one, then the probability of higher category increases, and if the probability of exponential beta is less than one, then the probability of higher category decreases. Exponential beta value is interpreted with the reference category where the probability of the dependent variable will increase or decrease. In continuous variables, it is interpreted with one unit increase in the independent variable, corresponding to the increase or decrease of the units of the dependent variable. Based on this one can conclude that social category, monthly income of the family and branch of study are the factors having positive influence on employment among the diploma engineers.

Logistic regression of the graduate engineers: Initially log likelihood model was developed. The initial log likelihood value obtained is1233.721 which is a measure of a model with no independent variable, that is only constant or intercept. The final log likelihood value obtained is 1176.338 and this is measure of a model by considering all independent variables. The difference between the these two measures is the model chi-square value which is obtained as 57.33 and this has a significance $p<0.001$, if we are setting the significance at 0.05 level, we can conclude that there is a significant relationship between dependent variable and the set of independent variables.

Table 6.19 Log likelihood ratio tests of Graduate Engineers

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	1233.721			
Final	1176.338	57.383	8	<0.001

Table 6.20 Beta Values of Factors Determining Unemployment of Graduate Engineers

		B	Exp (B)	95% Confidence Interval for Exp(B)	
				Lower Bound	Upper Bound
Employed	Intercept	-2.367			
	Social Category	-.301	.740	.580	.945
	Area of Residence	.143	1.154	.848	1.569
	Monthly Income of the family	.194	1.214	1.003	1.469
	Type of the Institution	-.262	.770	.661	.897
	Type of Schooling undergone	.135	1.144	.979	1.338
	Branch	.025	1.025	.948	1.108
	Parental Education	-.040	.961	.782	1.180
	Academic qualification	.052	1.053	1.026	1.081

The reference category is: Unemployed

The multinomial logit model shown in the table gives the following regression equations:

Log (p(employed)/p(unemployed) = -2.367 – 0.301 Social category + 0.143 Area of Residence + 0.194 Monthly Income -0.262 Type of institution +0.135 Type of School undergone +0.025 Branch -0.040 Parental education + 0.052 academic qualification measured in percentage of marks scored in B.Tech.

Exponential beta value is interpreted with the reference category where the probability of the dependent variable will increase or decrease. In continuous variables, it is interpreted with one unit increase in the independent variable, corresponding to the increase or decrease of the units of the dependent variable. Based on this one can conclude that area of residence, monthly income of the family, type of schooling undergone, branch of study and percentage of marks scored in B.Tech. are the factors that have positive influence on employment. (See the column Exp(B)).

6.7 Unemployment Estimation of the Diploma and Graduate Engineers Based on Apprenticeship Registration

To prove whether the issue of unemployment among the engineers is still live, there are various methods to measure the extent and magnitude of the problem of unemployment. One such method is the number of students registering in the professional employment exchanges and the other who register for apprenticeship trainee at the Supervisory Development Centers in their respective States.

The data from the professional employment exchanges consist of all the professionally qualified job seekers including technical and non-technical and categorizing the unemployed into technical and non-technical is a difficult task. Therefore, data from the SDC are relied upon to gather information about the incidence of unemployment among the engineers. The SDC in Kerala located at Kalmasserry provided the data of the number of Apprenticeship trainee students registered in each branches for the period 2009-10 to 2012-13 and the data are compiled in such a way so as to suit our method of analysis forming a cluster of only 9 branches in diploma and 7 branches at the graduate level.

6.7.1 Unemployment of the Diploma Engineers Based on Apprenticeship Registration

The unemployment data is compiled based on the number of students registering for apprenticeship hypothesizing that such students fail to get regular employment. The data as given in Table 6.21 shows that except in the branch of CABM, Hardware Maintenance and IT in all other branches the number of students registered for apprenticeship during the year 2012-13 is greater than that of the year 2009-10. Hence in total when there was only 2427 number of students registering for apprenticeship in the year 2009-10, it has increased to 3106 in the year 2012-13.The yearly increase in the number of students registering for Apprenticeship among the diploma holders reveals that the issue of unemployment is still live but the magnitude is different considering the fact that some branches have only a single digit growth in their registration computed in terms of compound annual growth rate whereas others have a double digit growth.

The following rate of unemployment among the diploma engineers in IT as in our earlier observations is again strengthened implying that less number of students are unemployed from this branch if apprenticeship registration is the tool of measuring unemployment.

The decline in the registration for apprenticeship among the diploma holders shows that the boom in the IT sector which benefited only the graduates is now recently enjoyed also by the diploma engineers but not in the branch of computer.

The data also shows the wide difference in the size of students registering for apprenticeship across the various branches of study. The highest average growth of registration for apprenticeship is in civil, architecture and related branches, whereas the least growth in registration is related to computer and IT. Hence it can be said that the issue of the problem of unemployment across their branch of study needs further investigation in identifying the real victims of unemployment. This is because the trend value of unemployment among the civil engineers shows a decline but an increase in apprenticeship is an indication of upward trend after 2009 which could also be attributed to relatively lower demand for civil diploma due to large outturn of civil graduate engineers. The bumping down effect in this sense is then operational after 2009.

Table 6.21 Number of Diploma Engineers Registered for Apprenticeship Trainee (2009-10 to 2012-13)

Branch of Study	Number of Students Registered for Apprenticeship in the years				CAGR
	2009-10	2010-11	2011-12	2012-13	
Civil, Architecture and related branches	120	153	137	206	14.46
Commercial Practice	93	82	150	134	9.56
Computer Engineering	255	317	312	383	10.70
CABM, Hardware Maintenance and IT	213	130	162	169	-5.62
Electrical	297	384	359	374	5.93
Electronics and Applied Electronics	463	460	280	557	4.73
Electronics and Communication	266	310	388	321	4.81
Mechanical	431	396	398	510	4.30
Others	289	304	311	452	11.83
Total	2427	2536	2497	3106	6.36

Source: Data compiled from SDC, Kerala

6.7.2 Unemployment of the Graduate Engineers Based on Apprenticeship Registration

The extent of unemployment among the graduate engineers and its presence in Kerala till the present period is further verified based on their number who registered for apprenticeship at SDC centre, Kalmassery and is given in the table 6.22

The data of apprenticeship among the degree engineers also reveals an upward trend in registration in almost all the branches of study with compound annual growth rate of 23.74 per cent in registration comparing the periods 2009 and 2013. It implies that the incidence of unemployment among the graduate engineers is not only growing but at the same time its growth is enormous also compared with the growth of unemployment among the diploma engineers and also with the other unemployment figures.

Table 6.22 Number of Engineering Graduates Registered for Apprenticeship Trainee (2009-10 to 2012-13)

Branch of Study	Number of Students Registered for Apprenticeship in the years				CAGR
	2009-10	2010-11	2011-12	2012-13	
Civil and Architecture	55	93	146	258	47.17
Computer Science	227	198	260	510	22.43
Electrical and Electronics	755	763	1218	2002	27.61
Electronics and Communication	901	869	985	2201	25.02
Information Technology	99	80	113	229	23.32
Mechanical	924	951	2242	1992	21.17
Others	477	536	494	868	16.14
Total	3438	3490	5458	8060	23.74

Source: Data compiled from SDC, Kerala

Among the branches it is observed that the highest growth in registration is in the branch of Civil and Architecture, whereas the least is in the branches belonging to other categories. The compound annual growth rate of registration among the graduates being higher than the diploma engineers also indicates the incidence of higher unemployment among the graduate engineers as compared to the diploma engineers.

The high growth in registration of apprenticeship among the civil engineers shows that unemployment among the civil engineers has now started increasing even if the factors responsible for its high demand in the labour market do not indicate any slowdown with a negative growth. Then the primary reason for such response is the large outturn of engineers after the year 2009. If we predict further increase in the outturn of graduate engineers considering that the batch of fresh engineers will pass from the newly started engineering colleges, then the unemployment condition in the engineering labour market will worsen further.

6.8 The Problem of Employability of Engineers and the Causes of Unemployment among the Diploma and Graduate Engineers in Kerala

The cause of unemployment is determined by unique characteristics related to the demand and supply of factors of production, say labour. The imbalance between demand and supply of factors either results in excess demand for labour or otherwise leads to unemployment. Thus unemployment of any type of labour is because of the lack of demand or because of excess supply. In traditional economic theories the supply of labour is largely determined by the demographic features based on the size of the population. But merely an increase in the population does not ensure an increase in the size of the labour of all types that are in demand. For instance to meet the increased demand for skilled labour, beyond increasing the size of the population, institutional facilities imparting education and training for such labour is also to be expanded. Anticipating a high demand for skilled labour, any attempt to expand the institutional size for increasing the supply of those skilled beyond the absorption rate will also result in unemployment. Hence unemployment among any kind of labour is either because of poor demand and excess supply.

Considering the fact that there is large incidence of unemployment among the qualified engineers, it can also be explained by either lack of demand or excess supply. The lack of demand of engineers is also explained by their low degree of employability and other factors, whereas the excess supply is mainly attributed to the large outturn due to expansion of engineering education of both vertical and horizontal nature.

6.8.1 The Problem of Employability of Engineers and Lack of Demand for Engineers

The term employability was introduced by Beveridge (1909) [19] an economist, but it remained hidden from researches till the 1970s. The issue of employability arises mainly because those who are prepared for employment do not find any employment in the labour market according to their expectation. Here employment means not only getting a job or pursuing a profession but sustaining it over life time also- an aspiration of every employee of knowledge societies (Tin, 2006)[20]. The factors that influence the employability of an individual is diverse because employability is an interaction of person, occupation and labour market demands. Therefore, the phenomenon of employability of workers is not just dependent upon the labour market forces but also on other factors [21].

Another study found that employability encompasses individual's potential (capabilities) of being successful in any labour market situations with

[19] Beveridge, W. H. (1909). *Unemployment: A Problem of Industry.* London: Longmans, Green Co

[20] Tin, K. L. (2006). Employability and Traits of Singapore Workers. *Research and Practice in Human Resource Management*, *14*(1), 1-28.

[21] Rajnish Misra & Prachee Mishra. (2011, April). Employability Skills: The Conceptual Framework and Scale Development. *Indian Journal of Industrial Economics*, *46*(4), 850-860.

focus on willingness as well as capacity to be successful in a variety of jobs (Thijssen, 1998 cited in Grip etal.2004:215-216)[22]. To enhance the employability of any worker, it is essential that he/she should possess essential skills that are required in the labour market. This skills are necessary for getting, keeping and doing well on a job, and more so skills can also be taught. Thus organizations take enormous effort in upgrading the skills of existing employees and also train the new entrants as soon as they are appointed in the organization. In India the IT giants like TCS and Wipro organize workshops for training educators and also impart learning to enhance the employability of graduating engineers.

The easiness of trainability also enhances the degree of employability. Thus as the level of education increases it is assumed that the chance of being employed increases. It is because the established fact based on previous experiences across the globe shows that higher education is associated with low levels of unemployment. In particular, graduates have historically been enjoying higher employment rates than with lower levels of education[23]. Nickell (1979)[24] also proposed a theoretical framework for the lower incidence of unemployment among graduates.

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22 Thijseen, J. (1998). Employability and Traits of Singaporan Workers. *Research and Practice in Human Resource Management, 14*(1), 1-28.

De Grip A, Loo J Van & Sanders J. (2004). The Industry Employability Index: Taking Accounts of Supply and Demand Characteristics. *International Labour Review, 143*(3), 211-33.

23 Imanol Nunez-Ilias Livanow. (2010, April). Higher Education and Unemployment in Europe: An Analysis of the Academic Subject and National Effects. *Higher Education, 59*(4), 475-487.

24 Nickell, S. (1979). Education and Lifetime Patterns of Unemployment. *Journal of Political Economy, 87*(50), 117-131.

But if we examine the existing unemployment with their level of education in India, it is found that there are incidences of unemployment also among the highly educated. The wide prevalence of educated unemployment among the youth results in their frustration and leads to loss of faith in education. The problem is more severe under conditions where even the professionals fail to find employment. Such is the case with the incidence of unemployment prevailing among the engineers. As the problem of unemployment among the engineers increases in magnitude the issue of employability among the engineers also arises. On the one hand there are arguments that the major factor leading to unemployment among the engineers is the large number of supply of engineering manpower. On the other hand there is another argument that the lack of demand of engineers due to poor employability is the cause of unemployment.

The lack of demand due to poor employability is cited in large number of cases. The NASSCOM and McKinsey report (2005) finds that most of engineering graduates are not employable in multinational companies. The report predicted that the Indian industry would face huge talent shortage in the coming years. It brought out the fact that currently only 25 per cent of fresh engineers and a mere 10 per cent of fresh general graduates are actually employable.[25]

Metroman E. Sreedharan finds the quality of a majority of engineers in the country below acceptable standards. He blames this on the uncontrolled growth of private engineering colleges with no regulatory body insight. He says that nobody is controlling quality and mass producing engineers without

[25] Gopalakrishnan, A. (2011). Employability and Transition to Labour Market in Emerging Economies: An Indian Perspective on Higher Education. *EAIR.33139*, pp. 1-10.: MPRA.

any quality is of no use to us. There should be a body to regulate and fix the minimum standard required for engineering education and bring out uniformity in the whole country[26].

A region based study on the engineering students in Tamil Nadu observes that 99 per cent of engineering students in Tamil Nadu, despite possessing adequate knowledge, are still not job-ready and this was based on the comments obtained from the HR feedback of the companies that stated that students lag in several areas like aptitude and technical test, communication skills, participation in group discussions, interpersonal skills and facing interviews (CJ Fulller, Haripriya Narasimhan 2006)[27].

A survey conducted by Blom and Saeki in 2009 across sectors and regions among the employers required them to rate their satisfaction with new engineering hirees with respect to 25 skills. Accordingly, 64 per cent of employers hiring fresh engineering graduates are only somewhat satisfied or worse with the quality of the new hirees. It further asked the employers to rate the level of importance of those 25 skills. The skills were then divided into three categories: core employability skills, communication skills and professional skills. The survey results show that while all the three skill sets are considered important, the employers perceive soft skills and communication skills as the most important. Among all skills, communication in English is among those most demanded; but however shows the smallest gap existing between the skill level demanded and that provided. Employer’s opinion based on the rating indicates that the graduates are relatively high on lower- order thinking

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[26] Ibid. pg-65

[27] C J Fulller, Haripriya Narasimhan, Engineering Colleges, Exposure and Information Technology Professionals in Tamil Nadu, Economic and Political Weekly ,Jan 21, 2006

skills (remembering, understanding) but low on higher-order thinking skills (analyzing, evaluating ,creating). These higher order thinking skills are among the most important professionals skills for engineers. The employer's demand for professional skill also differs across sectors, company sizes and regions. It is hence suggested that engineering schools should seek to improve the skill set of graduates and recognize the importance of soft skills[28].

Another study on the unemployment of engineers observes that 70 per cent of the engineering graduates in India are unemployable (Murali Pashupathi, 2011)[29]. This highlights on the under capacity of the engineering graduates of the basic engineering skills depriving them of the available employment opportunities. The ability of these engineers is undermined by many factors like the poor academic achievements of the students due to poor instructions imparted through under qualified faculty members and lack of the update of curriculum pointing to the major flaws of the existing educational system and structure of the technical education in India. However a detailed observation of the employed and unemployed engineers may also reveal some other factors responsible for their unemployment.

A recent comment on the reasons for low employability of engineering graduates identified some of the major factors causing unemployment. Among them some are institutional while the others are the outcome of economic factors. It is said that the new institutions established for imparting engineering education take only profit into consideration and are understaffed and lack in qualified, competent and suitable faculty members. Similarly in a

[28] Andreas Blom and Hiroshi Saeki. (2011). Employability and Skill Set of Newly Graduated Engineers in India. *Policy Research Working Paper, 5640*, 1-57.

[29] Pashupathi, M. (2011, November 13). How employable are our graduates? *The Hindu Daily*, p. 13.

majority of the institutions the course content is theoretical and ignored the application level that is necessary for industry showing the lack of interaction among academic institutions and industries. The teaching methods and evaluating system were inadequate to develop good engineers. At macro level the emergence of the IT sector has affected the quality of graduates in other traditional engineering disciplines. Knowing that it is easy to get job with a high salary in the IT sector, students from other disciplines also take as many IT related courses as possible as electives and hence do not give much importance to their discipline concerned. In the process we produce half baked- engineers, neither good in their own discipline nor in IT. Thus it is viewed that overdependence on software packages in some of the core discipline courses rather than on concepts has led to a poor understanding of the subject. The ignorance of the core subjects is also attributed to the emphasis on soft skills as the employers believe that people with soft skills can be easily trained. Beyond this the education system as a whole fail to impart knowledge without stressing simple and subtle concepts and it involves only tiresome details. The entrance tests conducted for the entry into engineering undergraduate courses emphasize speed and memory which are not fully sufficient for success in engineering. Since many of the engineers, when they come out of professional technical institutions, do not have adequate knowledge to implement projects or carry out research independently, it indicates the failure of ready made engineers. This tailor made engineers fail to adapt under frequently changing job requirements and it can be overcome only when there is a regular and structural interaction between academia and industries. Thus an all effort is needed to produce readily employable technical manpower in the country. The improvement of infrastructure, redesign of curricula, improvement of teaching-learning methods and attracting well-qualified teachers are only a few steps that could be initiated by individual institutions. The main challenge is to create an academic environment and education system that promote and ensure learning. The other societal and external efforts initiated along with the institutional effort will be complementary to each other[30].

From the above observations we can conclude that the main reasons why graduates are unsuitable for the job market are the lack of necessary language skills; the low quality of significant portions of the educational system and its limited ability to impart practical skills; and a lack of cultural fit, which can be seen in interpersonal skills and attitudes towards teamwork and flexible working hours (Farrell et al., 2005)[31].

A study on the employability of engineering graduates (aspiring minds, 2011) found that the employability of the engineers in IT Services is only 17.45 per cent, in IT Product it is only 2.68 per cent, in KPO it is 9.22 per cent, in Hardware Networking it is 36.57 per cent and in BPO it is 40.69 per cent. Similarly the employability of the females is greater only in Hardware Networking and BPO. The employability also differs between the regions classified on the basis of the type of city. The engineers from metros have higher employability rate than the engineers from the non-metros. Further there is difference in employability between states where Delhi, Bihar and Jharkhand exhibit high employability rate whereas the state of Andhra Pradesh and Tamil Nadu are in the lower ranks in terms of the rate of employability. Institutional based classification shows that the employability

[30] A.K. Sarkar and S.K. Choudhary, BITS Pilani (2014, April 10), Reasons for Low Employability of Engineering Graduates. Business Today

[31] D. Farrell, M. Laboissiere, R. Pascal, J. Rosenfeld, C. de Segundo, S. Sturze, and F. Umezawa, The Emerging Global Labor Market, McKinsey Global Institute, June 2005

of engineers from the government college is higher than the private colleges[32]. Thus there are large number of factors that determine the employability of engineers.

But low employability of the engineers only partially explains the reason for their poor demand. There are other reasons for the poor demand for engineers and their demand can also be increased by increasing-

1) The expansion demand which is the direct consequence of economic growth
2) The replacement demand which occurs when people leave the work force and their places are refilled.

For a developing economy like India, the employment prospects arise mainly from the new opportunities in the form of expansion demand and the replacement demand is significantly low with large retrenchment of the labour due to the advancement in Technology. The replacement demand arises mainly due to the voluntary attrition of the workforce from the existing firms for better career opportunities or is involuntary as they are declared unfit due to obsolescence. The replacement demand also arises because of superannuation. The lack of both expansion demand and replacement demand leads to unemployment.

The poor employability of the engineers and low economic growth are the major factors causing lack of demand for engineers, leading to their unemployment.

[32]Agarwal, V. (2011). *National Employability Report Engineering Graduates.* aspiring minds.

6.8.2 The Supply of Engineers and Unemployment

On the supply side the large outturn of engineers results in an increase in their supply. The years succeeding economic liberalization in India witnessed a large number of professional technical colleges opening in the private sector as a result of the opening up of the education sector. The unprecedented demand for technical manpower for creating the basic infrastructure for the growing economy and also growing manufacturing sector resulted in the induction of engineering students with capitation fees without even setting up the basic teaching infrastructure. However these institutions kept on churning out fresh engineering graduates on a regular basis resulting in a steady flow of low skilled technical manpower that the industry found unemployable (Chakravorthy and Sunny 2013) [33] leading mainly to the huge army of unemployed engineers.

But on the other hand the undue expansion of engineering education was also vital for India during periods when an industrial growth of more than 10 per cent per annum was to be achieved in the years particularly during 1960-61 to 1975-76. It is observed that the first three plans witnessed a very rapid expansion of facilities from a relatively low base in the field of technical and professional education. During this period facilities for engineering education were increased by about six times at the degree level, about eight times at the diploma level and over ten times at the craftsmen level (Fourth Plan: A draft Outline)[34]

[33] Chakravorthy S K and Sunny K P. (2013). Industry-Academia Linkages and Employability of Fresh Engineers: Review of Recent Trends in India. In S. Thomas (Ed.), *Employability of Fresh Engineers- Issues and Challenges* (pp. 45-58). New Delhi: M D Publications.

[34] Fourth Plan: A draft Outline,p115

The target of Indian educational planning from 1956 to 1966- broadly the period of the Second and Third Plans -was physical expansion of output of engineers from the engineering colleges and polytechnics courses and of skilled workers from the Industrial Training Institutes and the newly industry-based training schools in the public sectors. The situation in India at present is an excess of low quality engineering degree holders with no practical factory training, an excess of diploma holders in the initial stages whose course is a shortened version of the engineering degree and not thorough training workshop practice, production planning and supervision.[35]

Thus both the demand and supply factors are responsible for large scale unemployment among the engineers. The difference in the regional developments affecting both demand and supply factors further worsens this condition when measured across the states in India. This is because of the wide difference observed in the varied structure of education, the number of outcome of the engineers, the social and economic conditions prevailing in the state, etc. ultimately determining the quantity and quality of engineering education in the state.

6.8.3 The Causes of Unemployment among the Engineers in Kerala

Having an insight into the real causes of unemployment among the engineers essentially warrants views and opinion both from the employer and the employees. Their first hand experience is gathered here to determine the real cause of unemployment and the features of employment. The opinion regarding the employers is based mainly on the discussions with some of the HR personnel and placement officers in select colleges whose views are taken

[35] Angus, Hone. (1968, January). Economics of Improving Technical Education. *Economic and Political Weekly, 3*(1/2), 119-126.

as that of the employers and regarding the employees, information is collected directly from the passed engineering students.

The opinion of the HR personnel and placement officers: The common view shared among them is that the employment prospects of the engineers in the recent past indicate a gloomy profile with a large number of engineers landing up only in software industry that does not largely require an engineering degree. The following facts are revealed showing the features of engineering employment-

- Only the medium level companies and a fewer of the MNCs are recruiting the engineering professionals.
- The software companies are the major recruiters of engineers.
- Appointments in the core areas of employment are much fewer through manpower consultants
- Software companies recruit mainly from the branches of computer engineering, IT and Electronics and Communication.
- The average emoluments of the companies fall close only to 3 lakhs as CTC (Jan 2015)
- Most of the students prefer to go for MBA rather than taking up employment in engineering with lower emoluments.
- The new generation banks appointing engineers face a large rate of attrition due to immense pressure of work among the engineers and work fatigue due to stereotype work and nontechnical job nature, etc.[36]

[36] Shreds manpower Consultants, Kerala

The opinion of the passed engineers: The real cause of unemployment can only be known by collecting information from the passed engineering students. This is because they are the real victims of unemployment. Among the large number of factors that cause unemployment the apprehensions of the students regarding their unemployment based on the sample survey reveal some reasons. The identified reasons are:-

- Lack of job opportunities in their area of study.
- Period of Job search for better opportunities, better salary and convenient placement.
- Institutional factors such as poor reputation and lack of placement facilities.
- Unemployment imposed due to the recession during the period.
- Academic underperformance of the student.
- Post married reasons particularly among the females.
- Some of the responses are no job offered to the seeking employees

The degree of strength of this factors differs between the diploma and graduate engineers and is discussed and analysed.

6.8.3.1 Unemployment Cause among the Diploma Engineers: Primary Data Analysis

Information is collected from the passed diploma and graduate engineers from the samples and they will give the perspective of passed engineers regarding their unemployment. Among the diploma engineers in Kerala, the students' opinion holds that the most important cause of their unemployment is the lack of job opportunities in their area of study primarily due to the fact that there is a skill mismatch between what is acquired from the institution and what is required in the labour market. The skill gap here is attributed to the fact that the engineers are demanded less in their area of specialization.

Table 6.23 Cause of Unemployment among the Diploma Engineers in Kerala

Reason of being Unemployed	Number	Percentage Strength	Unemployed (in Percentage)
Lack of job opportunities in the area of Study	122	62.9	18.4
Lack of reputation of the Institute	2	1.0	0.3
Poor placement Facilities	1	0.5	0.2
Academic underperformance	1	0.5	0.2
Recession effect	5	2.6	0.8
Post marriage reasons	24	12.4	3.6
Lack of convenient placement	7	3.6	1.1
Awaiting better opportunities	7	3.6	1.1
Low salary offer	2	1.0	0.3
No job offer	23	11.9	3.5
Total	194	100.0	29.2

Source: Field survey

Hence 62.9 per cent of the engineers stated that they are unemployed primarily because of the lack of job opportunities in their area of study particularly in the core areas.

The other important reason for being unemployed is the post marriage conditions particularly among the females engineers where out of the total unemployed 12.4 per cent have expressed post marriage conditions as the reason for being unemployed.

Among the other reasons of unemployment, some have stated “no convenient placement”, others looking for better job opportunities and there are others who are unemployed due to low salary offer. These are considered as job search period of unemployment and in total it consists of 8.2 per cent of the unemployed.

The other reasons of being unemployed such as poor reputation of the institution of study, poor placement facilities in the institution are considered as the institutional factors of unemployment which in total is 1.5 per cent.

The academic underperformance as expressed by the students is likely to be a subjective expression and is biased too; but considering that the students have made an impartial self assessment. It is observed that 0.5 per cent of the students have expressed their own poor academic underperformance as the reason of their unemployment.

The other important and influencing factor on the prospects of employment is the economic condition prevailing in an economy where a period of boom is associated with good employment opportunities, whereas if the economy experiences unprecedented and unwarranted economic downturn, the employment opportunities are bleak. The economic conditions apart, the structure of the economy is also a factor influencing the magnitude of employment of engineers. Assuming that the engineers are largely employed in the manufacturing sector, any economic conditions that affect the manufacturing sector will have a direct bearing on the nature of employment, growth of employment, etc. through expansion of demand for labour. The economic recession, therefore, directly affected the scope of immediate employment for the engineers during the period of world recession of 2009 when the manufacturing and IT sectors were adversely affected by high incidence of poor growth and lay off. But the student perception on the impact of economic recession leading to their unemployment is abysmally low with only 2.6 per cent of engineers holding recession as directly responsible for their unemployment.

The rest of the engineers have stated no job offer as their cause of unemployment which constitute 11.9 per cent among the total unemployed diploma engineers.

6.8.3.2 Unemployment Cause among the Graduate Engineers: Primary Data Analysis

The graduate engineers, unlike the diploma engineers have a different perception on the cause of unemployment; but there are similarities as a majority of the graduate engineers also believe that the lack of job opportunities in their area of study is the main cause of unemployment with 57.1 per cent of the unemployed graduate engineers of this opinion.

This is substantiated by the fact that the engineers who specialize in different branches fail to get absorbed in the core area of study and seek employment outside their core areas including IT and Banking sector. The emerging IT sector propelled by outsourcing ventures further augments the job opportunities in this sector for engineers particularly because the IT firms believe that it is easy to train the engineers vis-a-vis the other conventional graduate holders. The opening of the banking sector in India has also resulted in the birth of new generation banks looking for a talent pool that are easy to train and hence recruit the engineers in this sector. But there are engineers who are not willing to take employment in this new area of employment opportunities rendering them unemployed for a long period of time.

The other important reason of unemployment among the graduate as well as the diploma engineers is the post marriage employment phenomenon particularly among the female graduate engineers with 20.1 per cent of the unemployed graduate engineers stating their reason of being unemployed after marriage .

The job search period of unemployment for the graduate engineers unlike the diploma engineers is however significant with 12.6 per cent of unemployed engineers being unemployed either due to the wait for better opportunities and lack of convenient placement.

The effect of recession on the prospects of employment is more on the graduate engineers compared to the diploma engineers because 9.4 per cent of the unemployed graduate engineers believe that the recession has adversely affected their chance of being unemployed. At the same time only 0.4 per cent of the graduate engineers hold institutional factors responsible for their unemployment due to poor placement facilities and none believing poor reputation of the institution as the cause of their unemployment.

Table 6.24 Cause of Unemployment among the Graduate Engineers

Reason of being Unemployed	Number	Percentage	Unemployed(in%)
Lack of Job Opportunities in the area of Study	145	57.1	11.7
Lack of reputation of the Institute	Nil	-	-
Poor placement facilities	1	0.4	0.1
Academic underperformance	Nil	-	-
Recession Effect	24	9.4	1.9
Post married reasons	51	20.1	4.1
Lack of convenient placement	5	2.0	0.4
Awaiting better opportunities	27	10.6	2.2
Low salary	Nil	-	-
No job offer	1	0.4	-
Total	254	100.0	20.5

Source: Field survey

6.9 The Factors Leading to Unemployment – A Comparative Study between the Diploma and Graduate Engineers Based on Canonical Discriminant Analysis

The factors leading to unemployment among the diploma and graduate engineers as reported are different. Major factors explaining the profile of the respondents –course of study, gender, social category, residence and type of institution are the factors discriminating the cause of unemployment among the engineers. To prove empirically, we performed the canonical discriminant analysis and the result of the same is reported in table 6.25.

Table 6.25 Canonical Discriminant Analysis of the Cause of Unemployment among the Diploma and Graduate Engineers

Characteristic	Eigen value	Canonical correlation	Wilks Lambda	Chi-square	df	Sig
Course of study (diploma/graduate engineering)	.138	.348	.879	57.104	9	.000***
Gender/sex	.233	.435	.811	92.524	9	.000***
Social category	.019	.137	.981	8.348	9	.499
Area of residence	.032	.177	.969	14.055	9	.120
Type of institution of study	.039	.193	.963	16.791	9	.052*
Level of parental education	.083	.277	.923	35.284	9	.000***

***significant at 1 % level, * significant at 10% level

From the analysis it is observed that the profile of the respondents based on the course of study, their gender characteristics, type of institution and level of parental education is discriminated based on the various cause of unemployment and are found significant. The social category and area of residence however is not discriminated based on the causes of unemployment.

6.10 Findings and Conclusions

The above chapter when analysed on the nature of the problem of unemployment and underemployment and their cause among the engineers in Kerala reveals the following facts.

a) Real or actual employment among the diploma and graduate engineers

Among the diploma engineers in various branches of study, the really or actually employed are highest in the branch of mechanical, whereas among the graduate engineers they are highest in the branch of computer science and information technology. Here really employed means those who are better off than other as their income is greater than that of the income drawn by the engineers in all other branches.

The male engineers are found to be really employed both among the diploma and graduate engineers enjoying higher income. Similarly the majority of the engineers belonging to the general category enjoy higher income among both the diploma and graduate engineers and are therefore considered as really employed. The rural urban classification of the engineers shows that more of the rural diploma engineers are actually employed, whereas among the graduate engineers the urban engineers are actually employed as compared to the rural graduates. The institutional-wise classification of the engineers shows that among the diploma engineers the actually employed are found to be high in private unaided colleges, whereas among the graduate engineers they are high in government colleges.

Above all, the actually or really employed engineers are high among the graduates than the diploma engineers.

b) Underemployment among the diploma and graduate engineers and its characteristics

The branch-wise comparison of the rate of underemployment shows that it is high in the branch of commercial practice among the diploma engineers while for the graduate engineers it is found to be high in the branch of electrical and electronics. The gender characteristics of the engineers shows the burden of underemployment being borne more among the females at diploma level but at the graduate level it is found high among the male graduate engineers. The degree of incidence of underemployment among the engineers based on their social category shows that the rate of underemployment is found to be high in the category of SC and ST among the diploma engineers while it is found to be high in the other backward class category among the graduate engineers. The effect of underemployment is more among the rural engineers irrespective of the course of study pursued in engineering. The effect of underemployment among the type of institution shows that the government engineering colleges fair bad in reducing the rate of underemployment compared to the other colleges at diploma level but this is found to be more in private aided colleges among the graduate engineers.

Above all the rate of underemployment is found to be high among the graduates as compared to the diploma indicating higher discrimination in their income.

c) Unemployment among the diploma and graduate engineers and its characteristics

The problem of unemployment as per the secondary data shows that the growth rate of unemployment among the diploma engineers is decreasing whereas that of the graduate engineers it is increasing. The branch-wise comparison of the secondary data also shows that the growth of unemployment among the diploma engineers is found to be higher in the branches of computer application and business management, hardware maintenance and information technology followed next by the branch of electronics and communication and their associates. Among the graduate engineers the rate of unemployment is high in the branch of computer science.

The apprenticeship details used to estimate unemployment based on their branch-wise growth of registration shows that it is highest in the branch of civil and architecture among both the diploma and graduate engineers indicating their high rate of unemployment as time progresses.

But the branch-wise analysis of the primary data shows that the unemployment rate is the highest in the branch of commercial practice among the diploma holders, whereas for graduate engineers it is found to be the highest in the branch of Information Technology and Computer Science. The burden of unemployment as borne by the engineers based on their gender characteristics shows that the women unemployment rate is greater than the men both among the diploma and graduate engineers. The comparison of rate of unemployment among the engineers based on their social category reveals that it is high among the OBC category engineers both at diploma and graduate level. The rate of unemployment is also high among the engineers from rural areas both at diploma and graduate level. The incidence of unemployment based on the type of institution of study shows that it is high in government colleges among the diploma engineers while it is found to be high in private unaided colleges among the graduate engineers.

Above all the primary data results also show that the rate of unemployment among the diploma engineers is greater than that of the graduate engineers. Based on the growth of unemployment over the periods we can reject the incidence of bumping down effect of unemployment among the engineers though the existing high rate of unemployment prevailing among the diploma engineers is partially explained by the bumping down effect.

d) Inferential analysis of the diploma and graduate engineers

The chi-square results of the difference in the rate of employment, underemployment and unemployment among the diploma engineers show that it is significant only in branch and gender classification. The chi-square results of the difference in the rate of employment, underemployment and unemployment among the graduate engineers shows that it is significant in branch, gender, social category, area of residence and type of institution of study.

Based on the logistic regression it can be concluded that the major factors having a positive influence on employment among the diploma engineers are social category, the monthly income of the family and the branch of study whereas among the graduate engineers the major factors having a positive influence on employment are the area of residence of engineers, monthly income of the family, the type of schooling undergone, branch of study and academic performance measured in percentage of marks.

e) Unemployment cause among the diploma and graduate engineers in Kerala

The major cause of unemployment among the engineers is their poor employability, slow economic growth and large outturn of the engineers

The engineering employment at present is characterized by a low demand for engineers in their core areas and large number of engineers depend for employment on the software and IT industry. Thus any factor that adversely affects the software and IT industries will have a larger repercussion in the engineering labour market.

The cause of unemployment from the student's perspective among the diploma and graduate engineers reveals that the lack of job opportunity is the major cause of unemployment among both the diploma and graduate engineers and hence reveals a skill mismatch between what is required by the employers in total and what is offered by the employee in total. Among the employees the post marriage conditions are highly responsible for the unemployment among the female engineers in particular both at the diploma and graduate level; but the magnitude of influence is high among the graduate engineers.

The job search theory of unemployment is found to be equally relevant both among the graduate engineers as more than 2 per cent of unemployment is due to job search explained by factors such as waiting for better opportunities, lack of convenient placement at present and low salary. The strength of job search is however higher among the graduates as compared to the diploma engineers. The effect of recession is however found to be high among the graduate engineers as compared to the diploma engineers. The academic reasons for unemployment are irrelevant for both the diploma engineers and graduate engineers from the student's perspective. The institutional conditions leading to unemployment are very marginal both among the diploma and graduate engineers. Many of the graduate engineers have been indifferent towards framing an opinion regarding the cause of unemployment.

The canonical discriminant analysis shows that the cause of unemployment discriminants that are influenced by factors such as the course of the study, their gender characteristics, type of institution of study and level of parental education are found to be significant and they explain their specific cause of unemployment.

Beyond all this the increase in unemployment based on the employers perspective focus more on the worsening rate of unemployment due to the lack of employability of engineers. Further there are experts who also believe that the excess supply over demand that can be absorbed in the engineering labour market has also worsened the condition of unemployment.

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Chapter 7

CONCLUDING OBSERVATIONS

Contents

Technical education in India in the recent years has witnessed radical changes with high achievements in the field of science and technology coupled with the saddening phase of development displayed in the form of a large army of underutilized and unemployed technical manpower. Technical manpower in India is unemployed owing to the imbalances created in the labour market with an expanding supply-demand gap. The educational policies framed during the post liberalisation period in the technical and professional education resulted in vertical and horizontal expansion of technical institutions. At the same time less than the proportionate growth in the manufacturing and other technical absorbing sectors further worsened the existing supply-demand gap. An analysis of the features observed in the technical manpower in India represents multi dimensional facets due to its diversified characteristics across various types and regions. The present analysis is an attempt to understand the employment aspects and the incidence of unemployment observed in the engineering labour market at the diploma and graduate level in the state of Kerala.

7.1 Activity Status of the Diploma and Graduate Engineers in Kerala

The activity based analysis of the engineers in Kerala shows that the majority of the engineers both at the diploma and graduate levels are largely employed as regular paid employees with observable difference at the graduate level. Thus it reveals the preference of engineers for employment soon after the completion of their course. The difference in the activity of the engineers shows that there is an observable difference in the activity status both among the diploma and graduate engineers across the characteristics of their branch of study, gender, social category and type of institution of study implying that such factors have a significant influence on determining the activity status of engineers in Kerala after passing from their respective courses. The spread of activity of engineers, even if it is highly divergent between the diploma and graduate engineers, the strength of the each factor determining the nature of the activity among the engineers is not equal among both the diploma and graduate engineers.

The main activities of the engineers include regular paid job, self employment, on contract job and on apprenticeship training. The engineers also pursue higher studies and the rest are unemployed. A majority of the engineers are in regular paid job among both the diploma and graduate engineers. The other employment opportunities for engineers include self employment, contract job and apprenticeship and the magnitude representing its strength is irrelevant because of their minuscule value.The branch-wise difference in the activities of the engineers both among the diploma and graduate engineers shows that the branch of study is a factor influencing employment with some branches exhibiting higher rate of employment absorption and others indicating higher incidence of unemployment.

Similarly it is observed that the male engineers are more in employment than the female engineers among both the diploma and graduate engineers. On the other hand, the incidence of unemployment among the female engineers is high both at the diploma and graduate levels. On examining the rate of employment an upper hand in getting employment sooner is observable among the OBCs at the diploma level, whereas among the graduate engineers the engineers belonging to the general category are more privileged to get early employment. The rate of unemployment is high among the OBCs both at the diploma and graduate levels of engineering. The activity status of the engineers as observed shows that it is also influenced by the type of institution of study and the employment absorption is high among the engineers from the government colleges at the diploma level. But at the graduate level it is observed that the engineers from private aided colleges are privileged to get employment sooner. As these institutions are small in number and have a good track record of the infrastructure and number of faculty many of the meritorious students are attracted to this thereby positively influencing the rate of employment absorption.

Among the various avenues of employment, it is observed that the engineers prefer to be in the status of a regular paid employee. Even if self employment is considered as a good opening for engineers by many of the experts, it is found that the engineers are reluctant to take any risk. Thus engineers here practice risk aversion by taking refuge in employment under an employer rather than displaying their own entrepreneurial skills.

The diploma engineers outnumber the graduate engineers in pursuing higher studies. But while comparing the diploma and graduate engineers who are pursuing higher studies a uniform pattern in their distribution across the various characteristics of the population is not evident.

As the unemployment among the engineers assumes dimension of higher proportion and also understanding that the engineers are less in number taking self employment, it is suggested that efforts should be taken to enhance the scope of self employment. This opinion holds significance under the condition of accepting the fact that the engineers are easily trainable since they are already skill equipped.

7.2 Employment Profile of the Diploma and Graduate Engineers in Kerala

The engineers after the completion of their course at the diploma and degree levels reveal their preference for employment as a majority of the engineers are on regular paid job and other types of employment. The employment conditions of these engineers who are employed reveal some unique characteristics indicating their profile of employment.

The employment profile of the engineers examined on the basis of their area of employment shows that diversion to other areas of specialization is more prevalent among the graduate engineers than the diploma holders. This is possibly because the graduate engineers have larger employment opportunities than the diploma engineers in other areas owing to the nature of the qualification acquired while they are also eligible for employment requiring a minimum graduate degree. The gender analysis of the employment area of the engineers shows that diversion among the female engineers is more prevalent compared to the male engineers. It is also observed that a majority of the engineers have diverted to other areas for employment because of no job opportunities in their area of specialization.

Function wise analysis of the engineers based on the type of function performed in their capacity shows that a majority of the engineers are in engineering related services, but the magnitude of it is high among the diploma engineers as compared to the graduates. Next to engineering related services, teaching is the important function for the diploma engineers, whereas among the graduate engineers software is a good opening for large employment opportunities. The dependence for employment on other non core areas among the majority of the engineers has questioned the need of opening new engineering colleges. The expert opinion in this regard is that starting new engineering colleges will further aggravate the problem of adverse employment conditions existing in the engineering labour market. The employment function of the engineers again shows that more of the male engineers are in engineering related areas, whereas the females are in other non engineering areas of employment. The analysis of the employment function based on their social category shows that engineers who have completed diploma and hailing from the general category are more in engineering related services whereas among the graduate engineers, the engineers belonging to the SC and ST are more privileged to get absorbed in engineering related services. The level of parental education however does not affect much in determining the employment function among both the diploma and graduate engineers.The difference in the employment function between the rural and urban diploma engineers is also marginal and insignificant in Kerala. Among the graduate engineers such a difference is found to be significant and more of the rural graduate engineers are employed in engineering related services. But in the software sector, the urban graduates are privileged to get more employment. The institutional difference in the employment function is also found significant only among the graduate engineers. The engineers coming out from the private aided colleges are relatively more in the engineering related services vis-a-vis to the engineers from the government college both at the diploma and graduate level.

The employment of the engineers in various sectors shows that both the diploma and graduate engineers are largely employed in the private sector leaving only little scope for the government and the public sector in the role of a prospective employer. The branch-wise difference in the rate of employment among the diploma and graduate engineers shows that the engineers in some branches are privileged to get more employment in the private sector and such a difference is significant. The gender distribution of engineers in employment across the various sectors of employment shows that the male engineers are more employed in the private sector. At the same time the employers obviously have a preference for engineers from the forward communities and the fact is borne out by the abundant presence of such engineers in their service. Thus it means that as the role of the private sector increases the immediate effect on the labour market is that it undermines the scope of employment of the underprivileged and those of the backward community. It is because in the private sector there is no mandatory requirement of appointments based on the principles of reservation for the backward classes.

Further the categorization of the engineers based on the type of institution of study shows that the private sector employment is more among the engineers passing from the private unaided colleges. But the difference in employment between the sectors based on the type of institution of study is found significant only among the graduate engineers.

Among the different means through which the engineers are employed, direct application is the largest source of getting employment. The role of placement cells functioning in institutions which assist in arranging employment for the engineers is found to be important only among the graduate engineers as only a few number of diploma engineers are absorbed in employment through the campus or off campus placements. The difference existing between the various means of getting employment across the branch of study is found to be significant both among the diploma and graduate engineers. But their difference based on the social category of the engineers is significant only at the graduate level. For all other characteristics of the engineers such as gender, type of institution and the region of institution, the difference between the various means of getting employment is found to be insignificant.

The level of job satisfaction among the engineers shows that the highest level of job satisfaction is attained among the graduate engineers compared to the diploma engineers. The dissatisfaction from job is high among the diploma engineers compared to the graduates. The male engineers are more satisfied with job as compared to the female engineers. The level of job satisfaction however is not influenced by the degree of the social backwardness of engineers as the level of job satisfaction does not reveal any uniform pattern of distribution based on the social category of engineers. Similarly the job satisfaction attained among the engineers classified on the basis of the type of institution of study shows that the satisfaction with job is found to be high among the private institutions, including both the aided and unaided institutions compared to the government colleges. The difference in the level of satisfaction is found to be significant only in the branch of study and gender among the diploma engineers. But among the graduate engineers such difference is found to be significant only in the social category and type of institution.

The monthly income of the engineers shows that the graduate engineers are earning more than the diploma engineers. Therefore the level of satisfaction is also high among the graduate engineers. The average monthly salary of the male engineers is higher than that of the female engineers. Similarly the average monthly salary of diploma engineers belonging to OBC is higher than the other categories and among the graduate engineers the average monthly salary is high among the general category. The average monthly salary of the engineers from the private aided colleges is higher than that of the engineers from other types of institutions among both the diploma and graduate engineers. The rural diploma engineers earn more than their urban counterparts whereas the urban graduate engineers are earning more than the rural graduates. Among the diploma engineers those who are in engineering services and IT related fields earn maximum income, whereas among the graduate engineers the highest income is drawn by those who are in administration and management. The monthly income drawn when compared between the various sectors shows that the engineers from the private sector earn the highest in both the diploma and graduate categories. The difference in the level of income is found to be significant both among the diploma and graduates when classified only on the basis of their branch of study and their gender.But such difference is found to be significant only among the graduates when classified on the basis of their social category, type of institution and area of residence though they are insignificant among the diploma engineers. The level of satisfaction attained from income among the engineers shows that their difference between the branches of study is insignificant. The level of monetary satisfaction among the male engineers is higher than that of the female engineers and this difference in the level of satisfaction is significant both among the diploma and graduate engineers. Similarly the level of monetary satisfaction is high among the engineers belonging to the general category and the difference in the level of satisfaction is significant only among the diploma engineers. The level of satisfaction attained by the engineers classified on the basis of their type of institution of study does not reveal any uniform pattern to make any precise generalization but the engineers from private institutions are more satisfied compared to the government institutions. The level of monetary satisfaction again shows that the urban engineers are more satisfied among both the diploma and graduate engineers but the difference in the level of satisfaction obtained from income is significant only at the graduate level.

As the employment profile of the engineers shows higher diversification of employment to other non engineering areas and also considering the fact that the functions rendered by many of them are revealing less satisfaction, it is suggested that concerted efforts should be taken by the government and institutions to place the engineers in their core branch of study. This will help them to increase their level of job satisfaction and also their level of income. The discrimination of any form can be arrested only when the government takes effective steps to control the labour market. Initiatives should be taken to intervene in the labour market so that it is not left over to the mercy of the private players where a monopoly is established by them in the labour market. The direct application is the major source of employment which leaves the employee to a disadvantage because it develops a psychological barrier among the job seekers. This can be reduced only by increasing the scope of other sources of employment such as placement cells, institutional arrangement of jobs, etc.

7.3 Academic Achievement of the Diploma and Graduate Engineers, the Engineers Pursuing Higher Studies and the Reasons for Pursuing Higher Studies

A comparison of the academic achievement of the diploma and graduate engineers does not show any large difference in the samples, but the mean achievement of the diploma holders is higher than that of the graduate engineers. Academically the female engineers excel slightly better than the male engineers and this difference is significant only among the graduate engineers. The academic achievement of the engineers based on their social category also reveals that the engineers belonging to general category outperform the other engineers who hail from the backward communities. The difference in the academic achievement based on the social category is found statistically significant both among the diploma and graduate engineers. Similarly the urban engineers are academically better than the rural engineers. The difference in the academic achievement between the rural and urban engineers is found to be significant only among the graduate engineers. It is also observed that the engineers from government colleges are better than the engineers from other types of institutions in terms of their academic achievement even if such a difference is only significant among the graduate engineers. The academic achievement of the engineers compared on the basis of their parental education also shows that the engineers of the highly educated parents record higher academic achievement than the rest of the group implying the influence of the parental education on the academic performance of the engineers.

The engineers now opting for higher studies are so many and higher studies are considered to be one of the important engagements of the engineers after the completion of their respective courses. The number of diploma engineers opting for higher studies is relatively more in their respective areas than the graduate engineers. The engineers opting for higher studies based on their gender characteristics show that both male and female engineers choose other non engineering areas for higher studies among the diploma engineers, whereas among the graduates the females prefer engineering areas for higher studies. The area of study of engineers when examined on the basis of their social category also shows that the engineers belonging to the general category have chosen other non engineering areas for higher studies. Similarly it is also observed that the urban engineers have a preference for non engineering streams vis-a-vis the rural engineers. However no definite conclusions can be drawn with regard to the engineers opting for higher studies based on their level of parental education.

The major factors influencing engineers to join for higher study are self-interest and it is evident both among the diploma and graduate engineers. The next important factor influencing higher studies among the diploma engineers is career improvement. Among the graduate engineers a large number of them join for higher studies because of no job offer and hence their preference for higher studies is a subtle aversion from the status of unemployment. The difference in the reasons for joining higher studies is found to be significant only in the branch of study among both the diploma and graduate engineers.

Academic improvement of the engineers is now a necessity as many of the engineers seek employment also through competitive examinations and GATE score. The category-wise differences in the academic achievement based on various factors show their disparity which can be reduced to a large extent by providing training to the weaker engineers and thereby reducing their failure rate. This will improve the quality of engineering education in total. The engineers pursuing higher studies is to be encouraged to reduce immediate unemployment arising due to large outturns and this can be practiced by broadening the dimension of the qualifications required for employment in areas which essentially requires higher levels of learning.

7.4 Unemployment and Underemployment among the Diploma and Graduate Engineers and the Cause of Unemployment

The kind of unemployment prevalent among the engineers is the Keynesian involuntary type of unemployment. The engineers are in search of a job in engineering and their concepts about the type of job to be chosen and the reservation wages set by them for accepting employment prevent them from taking any job that is below their expectation. Thus the engineers who are presently unemployed cannot be considered as unemployed forever. The present unemployment is a kind of the job search period of unemployment exposing the widening of the length of the waiting period for employment of engineers. It is an unwarranted phenomenon.

The rate of unemployment is found to be declining among the diploma engineers, but the unemployment rate among the graduate engineers is incremental based on the secondary data. The primary data shows that the rate of unemployment is still high among the diploma engineers compared to the graduate engineers. Thus the incidence of bumping down theory is truly absent in the engineering labour market since the analysis of their rate of unemployment over a period does not reveal any preference for graduate engineers by the employers substituting the diploma engineers.

A comparison of the rate of unemployment among the diploma and graduate engineers based on some characteristics shows that the branch of study is a decisive factor of employment among the engineers. The rate of unemployment among the female engineers is found to be higher than that of the male engineers. Based on the social category of the engineers, it is found that among the diploma engineers those belonging to the general category are more unemployed compared to other social categories. But among the graduate engineers the incidence of unemployment is more among the socially backward communities. Among the diploma engineers the rate of unemployment is high among the urban engineers compared to the rural. But at the same time the incidence of unemployment is higher among the rural engineers than among the urban at the graduate level.

The underemployment of the engineers is another important observable phenomenon in the engineering labour market. The narration of the engineers being underemployed means that the engineers are discriminated against each other as some of the engineers draw monthly income less than the average monthly income of the rest of the engineers in their particular branch and course of study. The incidence of underemployment is higher among the graduate engineers as compared to the diploma engineers. Similarly the male engineers are underemployed more than the female engineers at graduate level only. The rate of underemployment is found to be not related to the degree of backwardness among the engineers since it is found to be high in the SC and ST category among the diploma engineers but among the graduate engineers underemployment is high among those belonging to the other backward classes. The rate of underemployment is also found to be high among the rural engineers than the urban engineers. The institutional classification of engineering colleges also reveals an unhealthy trend in the distribution of underemployment among the engineers as it is found that underemployment among the diploma engineers is high in government colleges. But among the graduate engineers the rate of underemployment is found to be high among engineers from private aided colleges.

The factors that positively affect the prospect of employment among the engineers is the branch of study in engineering and monthly income of the family which is commonly observed both among the diploma and graduate engineers. Other than this among the diploma engineers, their social category is also found positively influencing employment, whereas among the graduate engineers the area of residence of the engineers and the type of schooling undergone and the academic performance of the students are also found to be positively influencing their prospects of employment based on the logistic regression.

There are a large number of factors that cause unemployment among the engineers. The prominent among them is the lack of job opportunities in their respective area of study. The incidence of unemployment among the female engineers is also because of the family responsibilities undertaken after marriage but its incidence is high among the graduate engineers. The job search period of unemployment is high among the graduate engineers since more of the graduate engineers are looking for better opportunities compared to the diploma engineers. The difference in the academic performance of the students has not resulted in unemployment among the engineers. The unemployment among the engineers in totality shows that the difference in the course of study, the gender features, the type of institution of study and the level of parental education with their unique features largely explains the cause of unemployment among the engineers.

The cause of unemployment as revealed shows that there are certain factors that are much controllable such as the lack of employability among the engineers. Hence efforts should be taken to restructure the syllabus in engineering in the direction of improving the employability skill of the engineers through interaction with the industry to get a correct feedback on the industry requirement. The curriculum should also be structured in such a way that the exposure to industry experience will directly benefit the engineers in increasing their employability. Efforts taken in this direction in Kerala at the diploma level is really commendable and the Technical University has also started the initiative of restructuring the curriculum.

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Appendices

Appendix 1

Table 1.1 The Number of Students Passed in Each Branch in Diploma and the Samples Taken

Branch	Sample Frequency	Per cent	Passed students	10 % of Passed
Applied Electronics	11	1.7	93	9
Architecture	5	.8	38	4
Automobile	23	3.5	182	18
Bio Medical	8	1.2	39	4
Computer Application and Business Management	10	1.5	136	13
Chemical	9	1.4	65	7
Civil	73	11.0	634	63
Commercial Practice	22	3.3	199	20
Computer	90	13.6	874	87
Computer Hardware Maintenance	38	5.7	281	28
Electrical	72	10.8	546	55
Electronics	100	15.1	981	98
Electronics and Avionics	2	.3	6	1
Electronics and Communication	31	4.7	265	27
Electronics and Instrumentation	17	2.6	147	15
Electronics and Production Technology	10	1.5	56	6
Information Technology	2	.3	10	1
Instrument Technology	6	.9	52	5
Mechanical	80	12.0	688	69
Medical Electronics	11	1.7	96	10
Polymer Technology	7	1.1	52	5
Printing Technoloigy	7	1.1	41	4
Quality Survey and Construction Management	2	.3	13	1
Telecommunication Technology	7	1.1	52	5
Textile Technology	10	1.5	48	5
Tool and Die Making	8	1.2	87	9
Wood Technology	3	.5	21	2
Total	664	100.0	5702	571

Source: Field survey

Table 1.2 The number of students passed in each branch in graduate engineering and the samples taken

Branch	Sample Frequency	Percent	Passed students	10 % of Passed
Agriculture Engineering	7	.6	34	3
Applied Electronics and Instrumentation	38	3.1	364	36
Architecture	12	1.0	88	9
Automobile	9	.7	34	3
Bio Medical	10	.8	70	7
Bio Technology	23	1.9	152	15
Chemical	19	1.5	95	10
Civil	80	6.5	740	74
Computer Science	232	18.8	2432	243
Electrical and Electronics	202	16.3	1553	155
Electronics and Communication	291	23.5	2961	296
Electronics and Instrumentation	14	1.1	113	11
Information Technology	89	7.2	784	78
Industrial	4	.3	22	2
Instrumentation	4	.3	25	3
Instrumentation and Control	3	.2	38	4
Marine Engineering	4	.3	26	3
Mechanical	163	13.2	1252	125
Mechanical Automobile	3	.2	32	3
Mechanical Production	3	.2	40	4
Naval Architecture and Ship Building	3	.2	18	1
Polymer Engineering	4	.3	10	1
Polymer Science and Rubber Technology	3	.2	16	2
Printing	5	.4	14	1
Production Engineering	10	.8	64	6
Safety and Fire Engineering	2	.2	14	1
Total	1237	100.0	10991	1096

Source: Field survey

Appendix II

Table 2.1 Outturn of Degree and Diploma Engineers in Kerala

Year	Degree	Annual Growth rate	Diploma	Annual Growth rate
1986	2393		2509	
1987	2005	-16.21	2547	1.51
1988	2016	.05	2995	17.58
1989	2022	.30	2852	-4.77
1990	2325	13.03	3201	12.23
1991	2319	-0.25	3488	8.96
1992	2161	-6.81	3720	6.65
1993	2246	3.93	4284	15.16
1994	2157	-3.96	2905	-32.19
1995	2547	18.08	2691	-7.36
1996	2441	-4.16	3278	21.81
1997	2795	14.50	4667	42.37
1998	3001	7.37	4790	2.63
1999	3571	18.99	5202	8.60
2000	3877	8.56	5006	-3.76
2001	4126	6.42	5286	5.59
2002	3764	-8.77	5942	12.41
2003	3944	4.78	5135	-13.58
2004	6554	65.92	6171	20.17
2005	8781	33.97	5848	-5.23
2006	12912	47.04	5556	-4.99
2007	12424	-3.77	5662	1.90
2008	9377	-24.52	5552	-1.94
2009	10991	17.21	5702	2.70

Source NTMIS BULLETTIN

Appendix III

Table 3.1 Activity Status of Diploma Engineers and Their Branch of Study

Branch of Study	Activity Status										Total
	On Paid Job		On Contract Job		Apprenticeship/ Trainee Employee		Pursuing Higher Studies		Unemployed		
	No	%	No	%	No	%	No	%	No	%	
Applied Electronics and Instrumentation	1	9.1	0	-	0	-	4	36.4	6	54.5	11
Architecture	2	40.0	0	-	0	-	1	20.0	2	40.0	5
Automobile	10	43.5	0	-	0	-	7	30.4	6	26.1	23
Bio Medical	4	50.0	0	-	0	-	2	25.0	2	25.0	8
Computer Application and Business Mnagement	4	40.0	1	10.0	0	-	0	-	5	50.0	10
Chemical	4	44.4	0	-	0	-	3	33.3	2	22.2	9
Civil	35	47.9	3	4.1	0	-	20	27.4	15	20.5	73
Commercial Practice	3	13.6	7	31.8	0	-	2	9.1	10	45.5	22
Computer Science	30	33.3	4	4.4	4	4.4	31	34.4	21	23.3	90
Computer Hardware Maintenance	7	18.4	4	10.5	3	7.9	11	28.9	13	34.2	38
Electrical	18	25.0	10	13.9	5	6.9	24	33.3	15	20.8	72
Electronics	21	21.0	5	5.0	8	8.0	31	31.0	35	35.0	100
Electronics & Avionics	0	-	1	33.3	0	-	1	33.3	1	33.3	3
Electronics & Communication	5	16.7	1	3.3	1	3.3	13	43.3	10	33.3	30
Electronics & Instrumentation	2	11.8	2	11.8	1	5.9	7	41.2	5	29.4	17
Electronics & Production Technology	3	30.0	0	-	1	10.0	3	30.0	3	30.0	10
Information Technology	1	50.0	0	-	0		0		1	50.0	2
Instrument Technology	1	16.7	0	-	1	16.7	1	16.7	3	50.0	6
Mechanical	24	30.0	3	3.8	12	15.0	22	27.5	19	23.8	80
Medical Electronics	4	36.4	0	-	0		3	27.3	4	36.4	11
Polymer Technology	1	14.3	3	42.9	0		0		3	42.9	7
Printing Technology	5	71.4	0	-	0		0		2	28.6	7
Quality Survey & Construction Management	2	100.0	0	-	0		0		0		2
Telecommunication Technology	0		0	-	1	14.3	1	14.3	5	71.4	7
Textile Technology	6	60.0	0	-	1	10.0	1	10.0	2	20.0	10
Tool & Die Making	1	12.5	0	-	1	12.5	3	37.5	3	37.5	8
Wood Technology	2	66.7	0	-	0		0	-	1	33.3	3
Total	196	29.5	44	6.6	39	5.9	191	28.8	194	29.2	664

Source: Field survey

Table 3.2 Activity Status of the Graduate Engineers and Their Branch of Study

Branch of Study	Activity Status										Total
	On Paid Job		On Contract Job		Apprenticeship/ Trainee Employee		Pursuing Higher Studies		Unemployed		
	No	%	No	%	No:	%	No:	%	No:	%	
Agriculture Engineering	3	42.9	0	-	2	28.6	1	14.3	1	.3	7
Applied Electronics and Instrumentation	14	36.8	2	5.3	0	-	6	15.8	16	42.1	38
Architecture	7	58.3	0	-	0	-	4	33.3	0		12
Automobile	5	55.6	0	-	1	11.1	0		3	33.3	9
Bio Medical	5	50.0	0	-	1	10.0	1	10.0	3	30.0	10
Bio Technology	9	39.1	0	-	0		10	43.5	4	17.4	23
Chemical	10	52.6	0	-	2	10.5	4	21.1	3	15.8	19
Civil	46	57.5	1	1.2	3	3.8	9	11.2	20	25.0	80
Computer Science	127	54.7	0	-	7	3.0	39	16.8	59	25.4	232
Electrical and Electronics	105	52.0	1	0.5	22	10.9	33	16.3	33	16.3	202
Electronics and Communication	159	54.6	0	-	8	2.7	65	22.3	59	20.3	291
Electronics and Instrumentation	5	35.7	0	-	2	14.3	3	21.4	2	14.3	14
Information Technology	61	68.5	0	-	2	2.2	2	2.2	23	25.8	89
Industrial	1	25.0	0	-	0	-	1	25.0	2	50.0	4
Instrumentation	1	25.0	0	-	0	-	2	50.0	1	25.0	4
Instrumentation and Control	1	33.3	0	-	0	-	0		2	66.7	3
Marine Engineering	2	50.0	0	-	2	50.0	0		0		4
Mechanical	95	58.3	0	-	12	7.4	35	21.5	21	12.9	163
Mechanical Automobile	2	66.7	0	-	0	-	1	33.3	0		3
Mechanical Production	0		0	-	0	-	2	66.7	1	33.3	3
Naval Architecture and Ship Building	2	66.7	0	-	0	-	1	33.3	0	-	3
Polymer Engineering	2	50.0	0	-	0	-	1	25.0	0	-	4
Polymer Science and Rubber Technology	2	66.7	0	-	0	-	1	33.3	0	-	3
Printing	2	40.0	0	-	1	20.0	1	20.0	1	20.0	5
Production Engineering	8	80.0	0	-	0	-	2	20.0	0	-	10
Safety and Fire Engineering	2	100.	0	-	0	-	0		0	-	2
Total	676	54.6	4	0.3	65	5.3	224	18.1	254	20.5	1237

Source: Field survey

Table 3.3 Activity Status of the Diploma Engineers across the Districts in Kerala

District	On Paid Job		On Contract Job		Apprenticeship/ Trainee Employee		Pursuing Higher Studies		Unemployed		Total
	No	%	No	%	No	%	No	%	No	%	No
Thiruvananthapuram	15	23.8	10	15.9	1	1.6	18	28.6	19	30.2	63
Kollam	6	14.6	3	7.3	5	12.2	5	12.2	22	53.7	41
Pathanamthitta	14	31.8	2	4.5	2	4.5	17	38.6	9	20.5	44
Alappuzha	9	18.8	0	-	3	6.2	18	37.5	18	37.5	48
Kottayam	9	25.7	2	5.7	3	8.6	6	17.1	15	42.9	35
Idukki	14	51.9	1	3.7	1	3.7	2	7.4	9	33.3	27
Ernakulam	22	36.1	3	4.9	4	6.6	14	23.0	18	29.5	61
Thrissur	28	29.2	6	6.3	7	7.3	36	37.5	19	19.8	96
Palakkad	13	39.4	4	12.1	4	12.1	6	18.2	6	18.2	33
Malappuram	13	21.3	2	3.3	3	4.9	24	39.3	19	31.1	61
Kozhikode	21	30.4	7	10.1	1	1.4	22	31.9	18	26.1	69
Wayanad	4	25.0	3	18.8	1	6.2	6	37.5	2	12.5	16
Kannur	13	36.1	1	2.8	4	11.1	8	22.2	10	27.8	36
Kasargod	15	44.1	0	-	0	-	9	26.5	10	29.4	34
Total	196	29.5	44	6.6	39	5.9	191	28.8	194	29.2	664

Source: Field survey

Table 3.4 Activity Status of the Graduate Engineers across the Districts in Kerala

District	On Paid Job		Self Employed		On Contract Job		Apprenticeship/ Trainee Employee		Pursuing Higher Studies		Unemployed		Total
	No	%	No	%	No	%	No	%	No	%	No	%	No
Thiruvananthapuram	102	56.7	1	0.6	3	1.7	0	-	42	23.3	32	17.8	180
Kollam	60	60.0	0	-	5	5.0	2	2.0	16	16.0	17	17.0	100
Pathanamthitta	32	65.3	0	-	1	2.0	0	-	4	8.2	12	24.5	49
Alapuzha	12	40.0	0	-	1	3.3	1	3.3	6	20.0	10	33.3	30
Kottayam	53	51.0	0	-	8	7.7	0	-	23	22.1	20	19.2	104
Idukki	26	52.0	0	-	2	4.0	3	6.0	13	26.0	6	12.0	50
Ernakulam	143	54.0	3	1.1	16	6.0	4	1.5	52	19.6	47	17.7	265
Thrissur	87	55.8	0	-	6	3.8	2	1.3	22	14.1	39	25.0	156
Palakkad	37	60.7	0	-	6	9.8	0	-	6	9.8	12	19.7	61
Malappuram	28	40.0	0	-	9	12.9	0	-	11	15.7	22	31.4	70
Kozhikode	52	58.4	0	-	3	3.4	1	1.1	14	15.7	19	21.3	89
Wayanad	3	60.0	0	-	0	-	0	-	2	40.0	0	-	5
Kannur	30	52.6	0	-	4	7.0	0	-	9	15.8	14	24.6	57
Kasargod	11	52.4	0	-	1	4.8	1	4.8	4	19.0	4	19.0	21
Total	676	54.6	4	0.3	65	5.3	14	1.1	224	18.1	254	20.5	1237

Source: Field Survey

Appendix IV

Table 4.1 Employment Area of the Diploma Engineers among Different Branches of Study in Total

Branch of study	Employed in the same area of study		Employed in the area different from their study		Total
	No.	%	No.	%	
Applied Electronics and Instrumentation	1	100.0	0	-	1
Architecture	2	100.0	0	-	2
Automobile	10	100.0	0	-	10
Bio Medical	3	75.0	1	25.0	4
Computer Application and Business Management	2	40.0	3	60.0	5
Chemical	3	75.0	1	25.0	4
Civil	35	92.1	3	7.9	38
Commercial Practice	9	90.0	1	10.0	10
Computer Science	29	76.3	9	23.7	38
Computer Hardware Maintenance	12	85.7	2	14.3	14
Electrical	33	100.0	0	-	33
Electronics	28	82.4	6	17.6	34
Electronics & Avionics	1	100.0	0		1
Electronics & Communication	5	71.4	2	28.6	7
Electronics & Instrumentation	3	60.0	2	40.0	5
Electronics & Production Technology	4	100.0	0	-	4
Information Technology	0	-	1	100.0	1
Instrument Technology	2	100.0	0	-	2
Mechanical	34	87.2	5	12.8	39
Medical Electronics	4	100.0	0	-	4
Polymer Technology	4	100.0	0	-	4
Printing Technology	5	100.0	0	-	5
Quality Survey & Construction Management	2	100.0	0	-	2
Telecommunication Technology	1	100.0	0	-	1
Textile Technology	7	100.0	0	-	7
Tool & Die Making	2	100.0	0	-	2
Wood Technology	2	100.0	0	-	2
Total	243	87.1	36	12.9	279

Source: Field survey

Table 4.2 Employment Area of the Graduate Engineers among Different Branches of Study in Total

Branch of study	Employed in the same area of study		Employed in the area different from their study		Total
	No.	%.	No.	%.	
Agriculture Engineering	1	20.0	4	80.0	5
Applied Electronics and Instrumentation	6	37.5	10	62.5	16
Architecture	7	87.5	1	12.5	8
Automobile	5	83.3	1	16.7	6
Bio Medical	5	83.3	1	16.7	6
Bio Technology	2	22.2	7	77.8	9
Chemical	11	91.7	1	8.3	12
Civil	44	86.3	7	13.7	51
Computer Science	116	86.6	18	13.4	134
Electrical and Electronics	93	68.4	43	31.6	136
Electronics and Communication	58	34.7	109	65.3	167
Electronics and Instrumentation	7	77.8	2	22.2	9
Information Technology	51	79.7	13	20.3	64
Industrial	0	-	1	100.0	1
Instrumentation	1	100.0	0	-	1
Instrumentation and Control	0	-	1	100.0	1
Marine Engineering	4	100.0	0	-	4
Mechanical	95	88.8	12	11.2	107
Mechanical Automobile	2	100.0	0	-	2
Naval Architecture and Ship Building	1	50.0	1	50.0	2
Polymer Engineering	3	100.0	0	-	3
Polymer Science and Rubber Technology	2	100.0	0	-	2
Printing	2	66.7	1	33.3	3
Production Engineering	8	100.0	0	-	8
Safety and Fire Engineering	2	100.0	0	-	2
Total	526	69.3	233	30.7	759

Table 4.3.1 Branch-wise Employment Function in Total of the Diploma Engineers in Kerala

Branch of study	Teaching No. (%)	Production/ Operation No. (%)	Sales/Service/P urchase No. (%)	Designing/Plan ning No. (%)	Administration/ Management No. (%)	Software/Hard ware No. (%)	Clerical/Office work No. (%)
Civil, Architecture and related branches	3 (7.1)	3 (7.1)	0	34 (81.0)	0	0	2 (4.8)
Commercial Practice	0	0	0	0	0	0	10 (100.0)
Computer Engineering	2 (5.3)	12 (31.6)	6 (15.8)	0	2 (5.3)	11 (28.9)	5 (13.2)
CABM,CHM, and I T	4 (20.0)	3 (15.0)	9 (45.0)	1(5.0)	0	0	3 (15.0)
Electrical	5 (15.2)	23 (69.7)	3 (9.1)	2(6.1)	0	0	0
Electronics and Applied Electronics	8 (22.9)	23 (65.7)	3 (8.6)	0	1 (2.9)	0	0
E&C and other related branch	2 (11.8)	10 (58.8)	1 (5.9)	2 (11.8)	0	0	2 (11.8)
Mechanical	0	32 (82.1)	2 (5.1)	2 (5.1)	0	0	3 (7.7)
Others	0	20 (44.4)	11 (24.4)	12 (26.7)	0	0	2 (4.4)
Total	24 (8.6)	134 (48.0)	35 (12.5)	53 (19.0)	3 (1.1)	11 (3.9)	19 (6.8)

Source: Field survey

Table 4.3.2 Branch-wise Employment Function in Total of the Graduate Engineers in Kerala

Branch of study	Teaching	Production/ Operation	Sales/Service/ Purchase	Designing/ Planning	Research & Development	Administration/ Management	Software/ Hardware	Clerical/ Office work
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Civil and Architecture	16 (27.1)	22 (37.3)	4 (6.8)	8 (13.6)	1 (1.7)	2 (3.4)	1 (1.7)	5 (8.5)
Computer Science	12 (9.0)	3 (2.2)	5 (3.7)	0	2 (1.5)	4 (3.0)	99 (73.9)	9 (6.7)
Electrical and Electronics	23 (16.9)	42 (30.9)	25 (18.4)	3 (2.2)	6 (4.4)	7 (5.1)	26 (19.1)	4 (2.9)
Electronics and Communication	19 (11.4)	24 (14.4)	14 (8.4)	0	6 (3.6)	5 (3.0)	78 (46.7)	21 (12.6)
Information Technology	12 (18.8)	1 (1.6)	1 (1.6)	1 (1.6)	1 (1.6)	6 (9.4)	34 (53.1)	8 (12.5)
Mechanical	13 (12.1)	63 (58.9)	15 (14.0)	1 (0.9)	4 (3.7)	1 (0.9)	7 (6.5)	3 (2.8)
Others	9 (9.8)	38 (41.3)	15 (16.3)	0	5 (5.4)	7 (7.6)	12 (13.0)	6 (6.5)
Total	104 (13.7)	193 (25.4)	79 (10.4)	13 (1.7)	25 (3.3)	32 (4.2)	257 (33.9)	56 (7.4)

Source: Field survey

Table 4.7.1 Branch-wise Monthly Salary of the Diploma Engineers

Branch of study	Number	Monthly Salary	Standard Deviation
Applied Electronics and Instrumentation	1	10000.0000	.
Architecture	2	9000.0000	1414.21356
Automobile	10	8100.0000	3381.32124
Bio Medical	4	5250.0000	866.02540
Computer Application and Business Management	5	7000.0000	1695.58250
Chemical	4	10075.0000	2675.03894
Civil	38	7394.7368	2666.50367
Commercial Practice	10	4690.0000	1137.68771
Computer Science	38	7039.4737	3245.33257
Computer Hardware Maintenance	14	5485.7143	2272.53066
Electrical	33	10984.8485	10272.44863
Electronics	34	8913.2353	10705.06329
Electronics & Avionics	1	6500.0000	.
Electronics & Communication	7	5500.0000	2783.88218
Electronics & Instrumentation	5	5400.0000	547.72256
Electronics & Production Technology	4	6750.0000	1500.00000
Information Technology	1	10000.0000	.
Instrument Technology	2	6250.0000	1767.76695
Mechanical	39	11953.8462	6250.80400
Medical Electronics	4	7750.0000	2061.55281
Polymer Technology	4	8500.0000	4358.89894
Printing Technology	5	12800.0000	4381.78046
Quality Survey & Construction Management	2	8000.0000	2828.42712
Telecommunication Technology	1	5000.0000	.
Textile Technology	7	10142.8571	3579.03951
Tool & Die Making	2	8000.0000	.00000
Wood Technology	2	16000.0000	8485.28137
Total	279	8601.2545	6402.13320

Source: Field survey

Table 4.7.2 Branch-wise Monthly Salary of the Graduate Engineers

Branch of study	Number	Monthly Salary	Standard Deviation
Agriculture Engineering	5	13400.0000	1140.17543
Applied Electronics and Instrumentation	16	25093.7500	14619.87090
Architecture	8	15750.0000	4026.69663
Automobile	6	16516.6667	7040.00473
Bio Medical	6	17416.6667	11456.07554
Bio Technology	9	21366.6667	7450.50334
Chemical	12	28375.0000	11447.75683
Civil	51	22087.8431	10748.11468
Computer Science	134	18157.6493	8524.64498
Electrical and Electronics	136	17782.4853	10084.77481
Electronics and Communication	167	18795.3892	9181.58330
Electronics and Instrumentation	9	16055.5556	10950.01268
Information Technology	64	18154.8750	8717.25499
Industrial	1	24000.0000	.
Instrumentation	1	30000.0000	.
Instrumentation and Control	1	22000.0000	.
Marine Engineering	4	30250.0000	3304.03793
Mechanical	107	22003.2336	14483.21690
Mechanical Automobile	2	16500.0000	7778.17459
Naval Architecture and Ship Building	2	45000.0000	21213.20344
Polymer Engineering	3	25833.3333	3685.55740
Polymer Science and Rubber Technology	2	30833.0000	8249.10771
Printing	3	14433.3333	5095.42278
Production Engineering	8	35250.0000	27571.98371
Safety and Fire Engineering	2	41950.0000	24112.34124
Total	759	19732.3808	11076.19071

Source: Field survey

Table 4.7.3 Level of Income Satisfaction of the Diploma and Graduate Engineers among the Male and Female Engineers

Gender	Highly Satisfied		Satisfied		Not Satisfied		Total
	No	%	No	%	No	%	
Diploma Engineers							
Male	58	30.7	45	23.8	86	45.5	189
Female	8	8.9	11	12.2	71	78.9	90
Graduate Engineers							
Male	146	32.8	86	19.3	213	47.9	445
Female	93	29.6	59	18.8	162	51.6	314

Source: Field survey

Table 4.7.4 Level of Income Satisfaction of the Diploma and Graduate Engineers and Their Social Category

Social Category	Highly Satisfied		Satisfied		Not Satisfied		Total
	No	%	No	%	No	%	
Diploma Engineers							
General Category	22	32.4	13	19.1	33	48.5	68
OBC	42	22.5	36	19.3	109	58.3	187
SC and ST	2	8.3	7	29.2	15	62.5	24
Graduate Engineers							
General Category	140	35.3	93	23.4	164	41.3	397
OBC	87	26.7	48	14.7	191	58.6	326
SC and ST	12	33.3	4	11.1	20	55.6	36

Source: Field survey

Table 4.7.5 Level of Income Satisfaction of the Diploma and Graduate Engineers and Type of Institution of Study

Type of Institution	Highly Satisfied		Satisfied		Not Satisfied		Total
	No	%	No	%	No	%	No
Diploma Engineers							
Govt College	52	22.6	44	19.1	134	58.3	230
Private Aided College	9	24.3	9	24.3	19	51.4	37
Private Unaided College	5	41.7	3	25.0	4	33.3	12
Graduate Engineers							
Govt College	125	35.6	71	20.2	155	44.2	351
Private Aided College	33	39.8	18	21.7	32	38.6	83
Private Unaided College	81	24.9	56	17.2	188	57.8	325

Source: Field survey

Table 4.7.6 Level of Income Satisfaction of Rural and Urban Diploma and Graduate Engineers

Area of Residence	Highly Satisfied		Satisfied		Not Satisfied		Total
	No	%	No	%	No	%	
Diploma Engineers							
Rural	51	23.3	41	18.7	127	58.0	219
Urban	15	25.0	15	25.0	30	50.0	60
Graduate Engineers							
Rural	124	26.3	94	19.9	254	53.8	472
Urban	115	40.1	51	17.8	121	42.2	287

Source: Field survey

Appendix V

Table 5.1 Branch of Study and Percentage of Marks Scored by the Diploma Engineers

Branch of Study	Number	Mean Marks scored in %	Standard Deviation
Applied Electronics and Instrumentation	11	70.0909	10.01453
Architecture	5	73.6000	4.44972
Automobile	23	67.7826	5.78365
Bio Medical	8	69.0000	6.94879
Computer Application and Business Mnagement	10	73.6000	5.73876
Chemical	9	74.4444	8.51632
Civil	73	68.8219	7.34912
Commercial Practice	22	69.5455	5.72985
Computer Science	90	68.0000	6.86957
Computer Hardware Maintenance	38	68.1316	6.09462
Electrical	72	71.0417	7.15313
Electronics	100	71.3000	7.09745
Electronics & Avionics	3	72.0000	7.21110
Electronics & Communication	30	72.6667	8.55140
Electronics & Instrumentation	17	73.2941	7.80837
Electronics & Production Technology	10	71.3000	7.54321
Information Technology	2	72.5000	4.94975
Instrument Technology	6	67.3333	8.93682
Mechanical	80	69.6000	6.95301
Medical Electronics	11	73.6364	8.41751
Polymer Technology	7	69.8571	8.21439
Printing Technology	7	63.0000	5.83095
Quality Survey & Construction Management	2	74.0000	1.41421
Telecommunication Technology	7	74.2857	7.65320
Textile Technology	10	71.4000	6.44981
Tool & Die Making	8	72.0000	6.52468
Wood Technology	3	81.6667	7.63763
Total	664	70.1491	7.28107

Source: Field survey

Table 5.2 Branch of Study and Percentage of Marks Scored by the Graduate Engineers

Branch of Study	Number	Mean Marks scored in %	Standard Deviation
Agriculture Engineering	7	77.0000	1.91485
Applied Electronics and Instrumentation	38	66.7895	6.99482
Architecture	12	64.7500	5.91031
Automobile	9	69.5556	3.84419
Bio Medical	10	71.3000	8.34066
Bio Technology	23	70.6522	4.12981
Chemical	19	66.5789	7.12831
Civil	80	69.8500	7.90145
Computer Science	232	68.8491	5.20478
Electrical and Electronics	202	69.0149	6.83238
Electronics and Communication	291	68.6976	5.64813
Electronics and Instrumentation	14	69.7143	7.86842
Information Technology	89	68.4045	5.19554
Industrial	4	72.7500	5.18813
Instrumentation	4	67.2500	5.12348
Instrumentation and Control	3	66.3333	1.52753
Marine Engineering	4	68.7500	4.57347
Mechanical	163	69.1043	5.59388
Mechanical Automobile	3	68.6667	3.05505
Mechanical Production	3	68.3333	2.88675
Naval Architecture and Ship Building	3	67.6667	2.51661
Polymer Engineering	4	74.0000	5.65685
Polymer Science and Rubber Technology	3	68.0000	7.93725
Printing	5	69.0000	2.82843
Production Engineering	10	71.7000	8.01457
Safety and Fire Engineering	2	69.0000	1.41421
Total	1237	68.9184	6.02776

Source: Field survey

Appendix VI

Table 6.1 Employment, Unemployment and Underemployment of Diploma Engineers and Their Branch of Study

Branch of study	Employed engineers		Underemployed		Unemployed		Total Passed Engineers
	No	%	No	%	No	%	
Applied Electronics and Instrumentation	1	9.1	0	0.0	6	54.5	11
Architecture	1	20.0	1	20.0	2	40.0	5
Automobile	3	13.0	7	30.4	6	26.1	23
Bio Medical	0	0.0	4	50.0	2	25.0	8
CABM (computer application & business management)	0	0.0	5	50.0	5	50.0	10
Chemical	1	11.1	3	33.3	2	22.2	9
Civil	10	13.7	28	38.4	15	20.5	73
Commercial Practice	0	0.0	10	45.5	10	45.5	22
Computer Science	9	10.0	29	32.2	21	23.3	90
Computer Hardware Maintenance	2	5.3	12	31.6	13	34.2	38
Electrical	8	11.1	25	34.7	15	20.8	72
Electronics	9	9.0	25	25.0	35	35.0	100
Electronics and Avionics	0	0.0	1	33.3	1	33.3	3
Electronics and Communication	2	6.7	5	16.7	10	33.3	30
Electronics and Instrumentation	1	5.9	4	23.5	5	29.4	17
Electronics and Production Technology	0	0.0	4	40.0	3	30.0	10
Information Technology	1	50.0	0	0.0	1	50.0	2
Instrument Technology	0	0.0	2	33.3	3	50.0	6
Mechanical	14	17.5	25	31.3	19	23.8	80
Medical Electronics	1	9.1	3	27.3	4	36.4	11
Polymer Technology	1	14.3	3	42.9	3	42.9	7
Printing Technology	1	14.3	4	57.1	2	28.6	7
Quality Survey & Construction Management	1	50.0	1	50.0	0	0.0	2
Telecommunication Technology	0	0.0	1	14.3	5	71.4	7
Textile Technology	1	10.0	6	60.0	2	20.0	10
Tool and Die making	0	0.0	2	25.0	3	37.5	8
Wood Technology	1	33.3	1	33.3	1	33.3	3
Total	68	10.2	211	31.8	194	29.2	664

Source: Field survey

Table 6.2 Employment, Underemployment and Unemployment of Graduate Engineers and Their Branch of Study

Branch of study	Employed engineers		Underemployed		Unemployed		Total Passed Engineers
	No	%	No	%	No	%	
Agriculture Engineering	0	0.0	5	71.4	1	14.3	7
Applied Electronics and Instrumentation	2	5.3	14	36.8	16	42.1	38
Architecture	3	25.0	5	41.7	0	0.0	12
Automobile	1	11.1	5	55.6	3	33.3	9
Bio Medical	2	20.0	4	40.0	3	30.0	10
Bio Technology	1	4.3	8	34.8	4	17.4	23
Chemical	7	36.8	5	26.3	3	15.8	19
Civil	13	16.3	38	47.5	20	25.0	80
Computer Science	60	25.9	74	31.9	59	25.4	232
Electrical and Electronics	26	12.9	110	54.5	33	16.3	202
Electronics and Communication	18	6.2	149	51.2	59	20.3	291
Electronics and Instrumentation	1	7.1	8	57.1	2	14.3	14
Information Technology	23	25.8	41	46.1	23	25.8	89
Industrial	0	0.0	1	25.0	2	50.0	4
Instrumentation	1	25.0	0	0.0	1	25.0	4
Instrumentation and Control	0	0.0	1	33.3	2	66.7	3
Marine Engineering	1	25.0	3	75.0	0	0.0	4
Mechanical	34	20.9	73	44.8	21	12.9	163
Mechanical Automobile	0	0.0	2	66.7	0	0.0	3
Mechanical Production	0	0.0	0	0.0	1	33.3	3
Naval Architecture and Ship Building	1	33.3	1	33.3	0	0.0	3
Polymer Engineering	1	25.0	2	50.0	0	0.0	4
Polymer Science and Rubber Technology	1	33.3	1	33.3	0	0.0	3
Printing	1	20.0	2	40.0	1	20.0	5
Production Engineering	2	20.0	6	60.0	0	0.0	10
Safety and Fire Engineering	1	50.0	1	50.0	0	0.0	2
Total	200	16.2	559	45.2	254	20.5	1237

Source: Field survey

Appendix VII

Schedule No:

Questionnaire for the Study Administered to the Diploma and Graduate Engineers in Kerala

COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY

KOCHI -688022

Identification Particulars

Course of the Study…………………….

Branch of the Study………………………..

District……………………………….

Name of the Institution……………….

Name of the Informant/Respondent

Name of the Investigator………………………Signature ……………………..

Name of the Supervising

Guide…………………......................................Signature……………………..

Questionnaire for Collecting Information on the Employment Realm of Fresh Engineers in Kerala

Section I: Individual and Personal Details of the Informant

1. Name of the Respondent /Informant : ……………………………………

2. Address

Residential Permanent (Same as Residential/Different)

House Name /Number………………….House Name/ Number……………………….

Post Office……………………………...Post Office………………………………...

Village/Town…………………………...Village/ Town……………………………….

District………………………………….District………………………………………

Contact Number (Land No:……………….(Mobile No:……….……………………..)

3. Age……………………

4. Sex……………………..(Male/Female)

5. The Social Category to which you belong(Put tick mark in the appropriate category)

a. General Category Name of the Community…………………….

b. Other Backward Classes Name of the Community……………………

c. OEC Name of the Community……………………

d. Scheduled Caste Name of the Community……………………

e. Scheduled Tribe Name of the Community……………………

6. Religion………………………………………………

7. Place of Residence : Rural/Urban……………………..

Section II: Family Background

8. The Educational Qualification and Occupation of your parents

Sl No	Name	Relation	Age	Sex	Education Highest Level attained /Exam passed	Occupation/ Employment			
						Major	Annual Income/Salary	Subsidiary	Annual Income/Salary

9. What is your Estimated Annual Family Income from all sources? (Put tick in appropriate place)
Actual Income………………………….. /

a. Below ₹ 6,000 b. Income of ₹ 5,000-12,000

c. Income of ₹ 12,000-24,000 d. Income of ₹ 24,000-50,000

e. Income of ₹ 50000-2,00,00 f. Above ₹ 2,00,000

10. What is the most important source of income of your family?(Put tick mark in appropriate place)
a. Salary as a regular employee on monthly basis
b. Income from self owned business or enterprise
c. Agriculture
d. Daily wage/weekly income received for the work done(casual labour, coolie, mason, porter, etc)
e. Pension
f. Other source

Section III Educational Qualification of the Informant

11. Name of the course in which you completed your engineering (Diploma/B.Tech.) ……………………………………………….

12. What is the branch of your study in engineering?………………………………

13. Mention the year of your admission to engineering………………………..

14. What is the name of the institution from where you completed your engineering course?…………………………………………………………………………

15. Name the district where your studied for engineering…………………………

16. What is the type of institution where you havestudied for engineering? (Put tick in appropriate place)

    a. Govt. college — b. University college
    c. IHRD institution — d. Govt. self financing colleges
    e. Private aided colleges — f. Private unaided college

17. In which syllabus did you complete your schooling? (Put tick in the appropriate place)

    a. Kerala syllabus — b. CBSE — c. ICSE
    d. Other state boards — e. Others

18. What was the type of school, where you did the majority of your schooling?
    a. Government school — b. Private aided school
    c. Private unaided school

Section IV Employment or Activity Details of those who are employed

19. What is your activity status as on September 2011? (Put tick in the appropriate place)
    a. On paid job — b. Self employed
    c. On contract jobd. — d. Apprenticeship trainee
    e. Pursuing higher studies — f. Unemployed and looking for job
    g. Unemployed but not looking for job

20. What was the date of joining in the present job?………………………………

21. How long you waited for the first job after the declaration of your results? (year and months)…………………………………….

22. What is the activity of the organisation where you are presently employed?
    (see codes for 22)
    Mention the activity ………………………………………
    Code……………………………

23. What is the main function of your job in the present employment? (see codes for 23)
    Mention the function…………………………………….
    Code………………………………

24. What is the sector in which you are presently employed? (see codes for 24)

    Mention the sector……………………………Code…………………………..

25. What was the means of getting employment in the present job? (see codes for 25)

Mention the means of getting

employment…………………………………………………….

Code………………………

26. What is the approximate monthly salary you are drawing in the present job? …………………………………..(in Rupees)

27 What is the area of your employment in the present job?

a. Employed in engineering area   b. Employed in areas other than engineering

28. Are you employed in the same area in which you specialised in engineering ? (Yes/No)

Code: 1 for Yes   Code: 2 for No

29 If you are not employed in the area of your study, what is the reason for your diversion? (Put tick in the appropriate place)

a. No job offer in the area of study

b. High remuneration offered in other area of study in the present job compared to the salary offered in the own area of study

c. Other non-monetary attractions of the job

d. Convenience of the place of job offered

e. Other reasons (specify)………………………………………………….

30. What is the level of satisfaction you attain from the present job? (put tick in appropriate place)

a. Highly satisfied   b. Satisfied in the present job

c. Not satisfied in the present job

31. Rank the factors according to their strength in determining your job satisfaction. (1 for the most influencing factor and 10 for the least)

a. The degree of creativity required in the job

b. The rewards and recognition attained from the job

c. The degree of risks involved in the job

d. The distance of the place of work from your home town

e. The facilities and amenities provided to you in the present job

f. The type of the co-workers present in the job

g. The type of the employer

h. The area in which you are presently employed (i.e. either related to your study in engineering or not)

i. The level of knowledge and skill acquired from the job

j. The nature of activity of the organisation where you are presently employed .

32. What is the level of satisfaction attained from the salary offered in the present job?
a. Highly satisfied b. Satisfied with the present salary offer
c. Not satisfied with the salary offered in the present job

Section V The Engineers pursuing Higher Studies and those planning for Higher Studies

33. If you are pursuing higher studies, name the course of your present study
Mention the name of the course……………………………………………

34. What is the main reason that you will state for pursuing higher studies?
a. Pursuing higher studies because of self interest
b. No job offer and opportunities in the job market after waiting for employment
c. Motivation from parents/friends/relatives and others to pursue higher studies(strike-off which is not relevant)
d. Joined higher studies to improve the career prospects and chance of getting employment

35. If you are planning for higher studies name the course you areinterested (Put tick in appropriate place)
a. Directly related to the area of engineering of the present course
b. Not directly related to the area of engineering of the present course
(Note: Directly related indicates the immediate higher course of the present study such as B.Tech for Diploma holders and similarly M.Tech. for B.Tech. holders)

Section VI If Unemployed

36. How long you are unemployed since passing your course? (Months and Days)
…………………(Months) …………………(Days)

37. Are you presently looking for job or not (State Yes or No)…………………….

38. Is the present unemployment your first state of unemployment (State Yes or No)……………….

39. What is the major reason of your state of Unemployment ? (Rank the degree of strength :1 for the most important cause and 11 for the least)
a. Lack of job opportunities in the present area of study ☐
b. Lack of reputation of theinstitution ☐
c. Poor placement facilities in the institution ☐
d. Your academic underperformance ☐ e. Recession effect ☐
f. Post married reasons ☐ g. No convenient placement received ☐
h. Looking for better opportunities and offers ☐
i. Low level of salary from the jobs offered ☐
j. Medically unfit to take-up the jobs offered ☐ k. No job offered as of now ☐

40. Are you prepared to migrate to other places for employment (State Yes/No)

41. If you are ready to migrate, what is your preference for job (put tick in appropriate place)
   a. Willing to migrate only outside Kerala but within India
   b. Willing to migrate abroad if the job offered is attractive in offer
   c. Willing to migrate abroad in search of job even without considering the amount of offer

Code for Question 21, 22, 23 and 24(Identify the code and mark in the respective Questions)

Nature of the activity(Qu:22)		Main Function in Job(Qu:23)		Sector of Employment(Qu:24)		Means of getting Employment(Qu:25)	
Code No:	Name of the Activity	Code No:	Name of the Function	Code No:	Name of the Sector	Code No	Name of the Source
1	Mining/Quarrying	1	Teaching/ Instructor	1	Central Govt	1	Employment Exchange
2	Processing	2	Production/ Operation	2	State Govt	2	Public Service Commission
3	Manufacturing	3	Service/ Sales/Purchase	3	Local Body	3	Direct Application
4	Construction	4	Maintenance & Repair	4	Public sector	4	Campus/off campus placement
5	Transportation	5	Stores Management	5	Private sector	5	Others
6	Storage & Communication	6	Administration	6	Multinational Company		
7	Electricity Gas and Water supply	7	Research & Development	7	Bank		
8	Health	8	Software Development	8	Cooperative Society		
9	Education	9	Hardware	9	Others		
10	Administration	10	Other/ Clerical				
11	Repairing Service	11	Designing/ Planning				
12	Other Service (Bank/Insurance)						
13	Software/IT						
14	Research & Development						
15	Shop						
16	Defence/Military						
17	Consultancy						
18	Others						

List of Publications

- Sabu Thomas, **Shelly M K.** (2009). Engineering Labour Market: Employment Scenario of the Fresh Engineers in Pre and Post Economic Recession Period-An Analysis of Kerala. *Productivity , 50* (3), 226-233.
- **Shelly, M. K.** (2013). Employment Scenario of Fresh Degree and Diploma Holders: Problems of Unemployment among the Engineers in Kerala. In S. Thomas (Ed.), *Employability of Fresh Engineers :Issues and Challenges* (p. 215). New Delhi: M D Publications.

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